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COMMUNICATIONS

COMPLETE AND INCOMPLETE FORMS OF THE BENIGN DISORDER CHARACTERISED BY TONIC PUPILS AND ABSENT TENDON REFLEXES

BY

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IN earlier papers on this subject it has been suggested that certain apparently dissimilar abnormal pupillary reactions formerly described as occurring in unrelated conditions are manifestations of the same disorder. The abnormal reactions are, on the one hand, the tonic pupillary reaction (syn. pupillotonia, myotonic reaction, tonic convergence reaction of pupils apparently inactive to light, Marcus's peculiar pupil phenomenon, non-luetic Argyll Robertson pupil, pseudo-Argyll Robertson pupil) and, on the other hand what may be called atypical phases of the tonic pupil. In the atypical phases tonic reactions are absent or difficult to detect and the state of the pupil in cases that present them is usually designated by the term fixed pupil, ophthalmoplegia interna, iridoplegia or partial iridoplegia, of unknown origin.

The disorder referred to, if the views expressed here are correct, may manifest itself in the following clinical forms:

A. The complete form characterized by the presence in one or both eyes of the tonic convergence reaction in a pupil apparently

inactive to light and by absence or diminution of one or more of the tendon reflexes.

B. Incomplete forms with (1) Tonic pupils alone. (2) Atypical phases of the tonic pupil alone. (3) Atypical phases of the tonic pupil with absence of reflexes. (4) Absent tendon reflexes alone. (This form will not be considered here.)

The evidence on which this synthesis was based is briefly as follows. Many cases have been described presenting the features of each of the forms just named. Apart from some of the pupillary signs the features of each group are identical in every respect. The high proportion of females affected, for example, is exactly the same in each group. In all of them too the eye signs are unilocular in a proportion of about four to one, that is in a proportion that differs from the incidence in any of the better known forms of abnormal pupillary reaction. No known hereditary constitutional or acquired disorder plays any part in the production of the abnormal signs; the course in each group is benign.

Considerations of this kind led me to the conclusion that the features that seemed to distinguish the groups, namely the different states of the pupil and the presence or absence of abnormal tendon reflexes, were fortuitous. This belief was strengthened when patients were encountered with tonic reactions in one eye and fixed or partially fixed pupils without tonic reactions in the other, some of them with and some without tendon areflexia. Further evidence was supplied in descriptions of cases that presented iridoplegia at one examination and tonic reactions some years later, or the reverse.

It is interesting to note the steps in the development of our knowledge of this subject. The tonic or myotonic pupillary reaction was first described in 1902 by Saenger[19] and by Strasburger[20] independently. Among the earlier records of cases presenting this anomaly I found nine in which absence of one or more of the tendon reflexes was mentioned; this aroused no curiosity in those who observed it but was passed over without comment or misinterpreted as evidence that the eye signs were luetic in origin; "probably congenital tabes," "incipient tabes dorsalis," "as yet no other signs of tabes or G.P.I." are representative of the comments on these cases.

In 1921 Behr[5] described eight new cases of pupillotonia and concluded that the presence of this abnormality did not justify a diagnosis of syphilis. In one of his patients the ankle jerks were absent.

In 1924 Foster Moore[13] published his first paper on the "Non-Luetic Argyll Robertson Pupil." His cases were characterized by "the complete or substantially complete inaction of the pupil to the light stimulus, the leisurely manner in which it contracts

with convergence and in which it dilates again after relaxation of convergence; the frequency with which it is unilateral; the integrity of accommodation; the absence of syphilis; the presence of knee jerks and the absence of signs of any nervous disease even after many years." His clear description of the pupillary phenomena leaves no room for doubt that he was describing the tonic pupil of other writers.

At this date then it was known that abnormal reactions superficially resembling the Argyll Robertson phenomenon might occur in non-syphilitic subjects. The occasional association of absent tendon reflexes with those signs had given rise to no comment.

In 1927 and in 1931 Morgan and Symonds[15, 16] published papers with the titles "A series of cases with rapid onset of unequal pupils and failure of accommodation: a *forme fruste* of encephalitis *lethargica*" and "Internal ophthalmoplegia with absent tendon reflexes." These papers are of great historical interest for our subject. Among earlier accounts of similar cases, the first of which I have knowledge was described in 1906 by Edwin Bramwell and Sinclair[6] in an article on "Ophthalmoplegia interna unilaterale," but Morgan and Symonds published the first *series* of cases presenting abnormal pupils and absent tendon reflexes of unknown but *certainly of non-luetic origin*. They described the pupils in their cases as being fixed or very sluggish to light and on convergence. In their second paper they mention Foster Moore's group but emphazise the differences between their cases and his.

According to the view expressed here the differences are immaterial and presented themselves fortuitously but at the time they seemed to justify a separation of the two groups. In one group, by chance, the tendon reflexes were normal in every case; in the other they were abnormal. In one group tonic pupillary reactions were present, in the other they were not observed. In one group accommodation was unaffected and the signs were found on routine examination, in the other visual symptoms came on suddenly and were found to be due to defective accommodation. Hence the identification of these groups as different manifestations of the same disorder was not suspected.

During the last year the number of cases available for study has been greatly increased in papers by Foster Moore,[14] Gordon Holmes,[9] and myself.[1, 2] Foster Moore reported 15 cases presenting the non-luetic Argyll Robertson pupil; whereas the reflexes were normal in his first series, diminution or absence of one or more of them was noted in three of his later cases.

Among 54 cases of partial paralysis of the pupil of unknown aetiology, Gordon Holmes found 19 in which the paralysis of the pupil was associated with signs of other nervous disease, chiefly

loss or diminution of the reflexes. In ten cases tonic pupillary reactions were detected. Holmes remarks that his group is allied to, possibly identical with, that described by Foster Moore, and while emphasising the non-syphilitic nature of his own cases, he quotes Gehrcke in support of the notion that tonic pupillary reactions may be found in a number of dissimilar conditions.

Our knowledge will be advanced if the views I have expressed are accepted as correct, namely that (1) all the groups mentioned above are certainly manifestations of the same disorder, and (2) that the tonic pupillary reaction, as here defined, is peculiar to this disorder.

So far we have been considering cases with tonic pupils alone, and tonic pupils or "atypical phases of the tonic pupil" with absent tendon reflexes. There remains for consideration the hypothetical form in which the disorder is manifested solely by the presence of an abnormal pupil which does not present tonic reactions. It will be more convenient if, before dealing with this group, the tonic pupil is described and attention drawn to some of its variants.

The Tonic Pupil

In its most characteristic form, the tonic pupil is unilateral, and considerably larger than its fellow. To the usual bedside tests the reaction to light, direct and consensual, is completely or almost completely absent. After a sojourn in a dark room for an hour or so the pupils usually dilate to an equal size; thereafter, on exposure to bright diffuse light the abnormal pupil, perhaps after some delay, contracts slowly and may continue to contract until it is smaller than it was before it dilated in the dark; after some delay it dilates slowly to its original size. The most consistent, the most easily recognized, and for diagnosis the essential feature of the true tonic pupil is its behaviour during and after convergence. While the patient gazes at a near object the pupil, often after some delay, contracts slowly and with increasing slowness through a range sometimes greatly in excess of the normal, often down to pinhead size; having been larger it almost always becomes much smaller than its normal fellow.

After the effort to converge is relaxed one of several things may happen; the pupil continues to contract (rare), or remains fixed for several or many seconds (the rule) or begins to dilate at once (common); dilatation once begun proceeds at a rate even slower than that of the preceding contraction and many seconds or even minutes elapse before it regains its usual resting size.

The ciliary muscle may be affected in the same manner; the resulting disturbance in accommodation is noticed most often during relaxation; after fixation of a near object several seconds

elapse before distant objects become clear. The movement of the ciliary muscle is slow but not reduced in range; it always corresponds to the age of the patient; there is no constant relation between the rate of contraction of the iris and of the ciliary muscle in the same case; tonic accommodation has never been observed apart from tonic convergence reactions (Axenfeld)[3].

The tonic pupil dilates well to mydriatics and contracts under eserine. Repetition does not facilitate movement as it does in myotonic skeletal muscles.

In the cases I have analysed the eye signs were unilateral in a proportion of just under five to one. There are very few exceptions to the rule that the abnormal pupil is the larger one. It is sometimes irregular in outline or oval with the long axis horizontal or vertical. Changes in size from time to time often through a wide range are common. (This is an important diagnostic feature.) Behr[5] saw marked hippus confined to the abnormal pupil in three of his cases.

The reactions often vary in the same eye at different times. In most of my cases I was able to confirm the observations that the pupil dilates in the dark (Dimmer)[7] and then contracts in bright diffuse light (Lerperger)[10] sometimes to a size smaller than it was before (Behr)[5]. Relaxation after convergence always proceeds more slowly than the tonic contraction. Both movements become slower as they proceed. Very rarely contraction is normal, dilatation only being abnormally slow. The tonic convergence reaction may easily be missed owing to the long delay that may occur before contraction begins. Some patients have difficulty in sustaining the effort to converge and must be persuaded to persist for 20 seconds at least; five or more seconds may elapse before contraction on convergence is detected which once begun may continue slowly through a wide range. On one occasion, in a patient whose pupil usually began to contract in about five seconds, ten seconds elapsed before any movement was noticed.

The more of these cases I examine the more firm is my belief that complete absence of contraction of the pupil on convergence is uncommon and that the tonic reaction would be found more often if it were diligently sought for in cases of "fixed pupil," "iridoplegia" and "partial iridoplegia" of unknown origin. Nevertheless the pupil in this disorder may rarely be so stiff that no reaction to light or on convergence can be obtained. One patient with a tonic pupil and absent tendon reflexes showed a typical convergence reaction in one pupil; in the other which had recently dilated suddenly no response was obtained to light or on convergence. In two others with no history of sudden dilatation, but like the one just mentioned with some difficulty in accommodating, one pupil was tonic the other fixed. It is possible that I was not

persisent enough in these cases but they prove that in some cases, certainly examples of this disorder, the pupils may be or appear to be completely inactive. Some of these fixed pupils present tonic reactions later; a pupil known to be tonic may dilate suddenly and then become fixed.

Isolated Ophthalmoplegia Interna and Iridoplegia of Unknown Origin

We can now consider the cases that abound in neurological and ophthalmolgical literature of ophthalmoplegia interna, ophthalmoplegia interna unilaterale, iridoplegia or partial iridoplegia for which no cause can be found.

Since 1878 when Jonathan Hutchinson introduced the term ophthalmoplegia interna many papers have appeared giving descriptions of series of cases with an analysis according to the supposed cause. In every series there is a large residuum after cases attributable to third nerve palsy, syphilis, diphtheria, encephalitis lethargica, herpes, atropine, and all other known causes of iridoplegia have been excluded. In many of these cases eye signs persisted for many years without the appearance of other evidence of nervous disease. In a few, tonic reactions appeared during the period of observation. Cases with tonic reactions in one eye and pupils of the kind now under consideration in the other have already been mentioned. The abnormal reactions are usually detected in early life and females preponderate.

With a full appreciation of the paucity of the evidence but impressed by the fact that the tonic reaction is not always sought for, that even when sought for it is easily missed, that the state of the pupils in these cases is exactly that seen in cases where the diagnosis is made certain by the associated abnormal tendon reflexes and that the incidence as regards sex and age is the same, I submit that many cases of ophthalmoplegia interna or iridoplegia of unknown origin are examples of the disorder described here. This matter will be mentioned again under diagnosis.

Relation of the Tonic Reaction to other Abnormal Reactions of the Pupil

Behr discussed this aspect of the subject and concluded that the tonic reaction differs essentially from the abnormal reactions seen in the Argyll Robertson pupil, fixed pupils and ophthalmoplegia interna. The Argyll Robertson pupil as described by its discoverer is small, usually bilateral, constant in size and unaltered by light or shade; it contracts promptly on convergence and dilates again promptly when convergence ceases; it dilates slowly and

imperfectly to mydriatics. It thus differs from the tonic pupil in every essential point and can hardly be confused with it by anyone who is familiar with the distinctive features of both anomalies. But because the tonic pupil seems to be inactive to light and does react on convergence, so conforming to the current incomplete and misleading definition of the Argyll Robertson pupil, patients with tonic pupils especially if the tendon reflexes are also abnormal are almost always thought to be suffering from syphilis of the nervous system. The tonic reaction is unilateral in about 80 per cent. of the cases; the Argyll Robertson pupil in about 5 per cent., the fixed pupil in less than 10 per cent. and ophthalmoplegia interna in about 20 per cent.

The tonic pupil is almost always larger than its fellow; the unilateral Argyll Robertson pupil is always the smaller. If we call a small pupil one with a diameter of less than 3 mm., then the tonic pupil is hardly ever small, whereas the Argyll Robertson pupil is small in 80 per cent. of cases, the fixed pupil in 9 per cent. and the pupil of ophthalmoplegia interna in 10 per cent. (Behr.) The tonic pupil often varies in size from time to time, and may show hippus. In the dark the pupils become equal. These things the unilateral Argyll Robertson pupil never does. The behaviour of the tonic pupil that has dilated in the dark is peculiar to it; slight changes with alterations in the illumination may occur in other conditions but not the full or even excessive movements of tonic pupils. The movement on convergence differs from that of the Argyll Robertson pupil; in the latter this is typically prompt and dilatation is equally prompt.

The fact that the tonic pupil can usually be made to contract through a normal range on exposure to light after a long sojourn in a dark room and on convergence if this is long enough sustained suggests that there is no true paralysis but some qualitative change in its mobility. The same is true of accommodation; the movement is slow but not reduced in range; this is essentially different from the findings in ophthalmoplegia interna where the diminished range of movement is decisive for diagnosis. Syphilis is an important factor in the production of other abnormalities of the pupil but here, I believe, it plays no part.

All the evidence seems to me to support the notion that the tonic convergence reaction in pupils apparently inactive to light is a thing apart. The peculiar extra-ocular phenomena (symptomless areflexia) that are frequently associated with it also suggest that we are confronted by a unique condition.

On the other hand it has been stated that tonic reactions have been observed in hereditary syphilis, tabes, general paralysis, disseminated sclerosis, diabetes and other conditions and that Gehrcke[8] collected 20 cases of this kind. The alleged syphilitic

cases are most numerous and most easily disproved. Gehrcke accepted the diagnosis of the original authors. Their mode of reasoning was that tonic reactions are a sign of syphilis of the nervous system, therefore syphilis is one of the causes of tonic reactions. His list is headed by three cases of general paralysis described by Piltz. These cases are ruled out by the fact that the reaction on convergence was normal. Markus's case is included, presumably because the knee jerks were absent. Markus's own comment on this case was that the signs "might be considered sufficient evidence of congenital syphilis. I am, however, inclined to take a less serious view." The cases of Nonne,[17] Lerperger[10] and Axenfeld[3] were labelled ? tabes dorsalis, tabes incipiens and lues congenita? respectively because tendon reflexes were absent. In none of the cases of supposed luetic origin was there any real evidence of syphilis. In 1921 when Behr studied the relation of the tonic reaction to syphilis he had to contend with the fact that many of the authors who preceded him believed that the tonic pupil was a variant of the Argyll Robertson pupil. Now, with close on a hundred cases available for study, we are able to form a very definite conclusion.

A large proportion of the patients with tonic pupils are healthy young females; the eye signs they present are not observed in known syphilitics; tendon areflexia when present is not accompanied by other signs of organic nervous disease and is symptomless; patients giving evidence that the eye signs have been present since childhood have lived many years without the appearance of other symptoms. In 37 cases to my knowledge the blood and cerebro-spinal fluid were examined, in 18 the blood only, with completely negative results. These tests have been done on a much larger number of cases but I find that I have not always made a note on this point when looking up the recorded cases. I can say, however, that in one case only (Barkan)[4] the Wassermann reaction was positive in the blood of a patient with no other sign of nervous disease except a tonic pupil. It is hardly likely that a form of syphilis of the nervous system exists which is commonest in healthy young women and is characterised by ocular and reflex phenomena peculiar to itself and never seen in known syphilitics, by the constant absence of a history of family or personal infection, by the absence of all other manifestations of syphilis and by its uniformly negative findings in the blood and cerebro-spinal fluid. It is more reasonable to suppose that syphilis plays no part in the production of this disorder.

I think the following conclusions may now be drawn with safety: the tonic convergence reaction in pupils apparently inactive to light is, in all probability, never a manifestation of syphilis of the nervous system: the combination of this sign with absent tendon

reflexes has never been observed in syphilis of the nervous system and is not one of its manifestations. The evidence for the alleged incidence of tonic reactions in disseminated sclerosis is confined to the case, a boy, aged 17 years, labelled by Strasburger[20] in 1902 "? sclerosis multiplex." The only case, so far as I know, of the association of tonic reactions with diabetes was recorded by Nonne in 1902. The patient, a man aged 40 years, presented glycosuria, tonic convergence reactions and absent ankle jerks. It is more than likely, as the case is an isolated one, that the associated conditions were unrelated.

The discovery of tonic pupils in patients with some other disorder naturally gives rise to the belief that the eye signs are of recent onset and a manifestation of the disease that is producing symptoms. Thus Roemheld[18] saw tonic pupils and absent reflexes in men with gunshot wounds of the head and labelled them "traumatic pseudotabes." Mayer[12] saw the same signs in a man who had been struck by lightning and published his case under the same heading. Apart from cases of this kind there is no evidence that tonic reactions may result from trauma. Equally unconvincing are the cases in which migraine, neurasthenia and measles are mentioned as evidence of the variable aetiology of tonic reactions. My conclusion is that the tonic convergence reaction in pupils apparently inactive to light is *sui generis* and that no known morbid factor plays any part in its production.

General Features

Taking all the forms together about 80 per cent. of the cases are females. The female preponderance is slightly higher in the group characterized by tonic pupils and absent reflexes. It may be therefore that females are not only more susceptible to this disorder but are also more likely to present tendon areflexia. The signs are frequently detected in the course of a routine examination and it is not possible to determine when they first appeared. Some patients say the pupils have "always" been unequal; this was noticed at the age of six months in a patient of Foster Moore's with tonic reactions at the age of 5 years. Sometimes the onset of symptoms is sudden; some discomfort is felt in the eye, vision becomes blurred and examination reveals a dilated pupil. Most of the patients who give this history are in the twenties or thirties but this gives no certain indication of the age of onset because we know that a pupil already tonic may dilate suddenly and then give rise to symptoms for the first time.

Apart from discomfort in the eye and difficulty in accommodation, both uncommon, the disorder runs a benign symptomless course. There was slight drooping of the lid in several of my cases.

Among 44 cases of tonic pupil described by ophthalmologists, absence of tendon reflexes was noted in nine. I suspect that the incidence of areflexia is higher than this. Neurologists on the other hand have reported groups of cases in which the reflexes were abnormal in every case; but this was their reason for including the cases in their series. Once it is recognized that the disorder may present itself in various forms reports on these artificial groups will cease and it will soon become possible to give the relative numerical incidence of the different forms. This cannot be done at present.

The most frequent extra-ocular sign is diminution or loss of one ankle jerk. I have never seen loss of any other jerk with both ankle jerks still present and equal. Asymmetry is not uncommon. In two of my cases the knee and ankle jerks were lost on one side only. The arm jerks rarely go before the knee jerks and ankle jerks are all lost. It is improbable that jerks once lost ever return.

The general health of all of my patients was remarkably good. There was nothing to suggest that they belonged to a neuropathic stock and nothing in the history recurs with sufficient frequency to deserve mention as a possible aetiological factor.

Diagnosis

The diagnosis of the complete form presents no difficulty; the combination of the tonic convergence reaction in a pupil apparently inactive to light with absence of one or more of the tendon reflexes is pathognomonic.

With regard to cases with abnormal pupils alone it must be understood that slowness of movement by itself does not constitute a tonic reaction; that is seen in retinal disease, in traumatic iridoplegia and in many other conditions. The typical tonic pupil shows delay as well as slowness in its responses; it usually responds to light after a sojourn in a dark room; it retains its new size after the stimulus is removed and relaxation is slower than contraction to light, with convergence, and when present, with accommodation. In most of the cases that appear on superficial examination to present fixed or partially fixed pupils appropriate tests will reveal tonic reactions. To elicit the reaction on convergence persistence is required on the part of the patient and the examiner. In difficult cases the most obvious sign is the relative smallness of the originally larger pupil when the patient looks into the distance after converging powerfully for half a minute or so. I am in the habit of allowing the patient to confirm this observation for herself in a mirror; it never fails to elicit an exclamation of surprise. If accommodation were tested in the patients with "ophthalmoplegia interna" who complain of misty vision it might be found that

accommodation though slow is not limited in range and that relaxation is slower than contraction. This would give the diagnosis, as tonic accommodation is peculiar to this disorder.

Where tonic reactions cannot be obtained the diagnosis may still be made with some confidence if the eye signs are unilateral and the patient is young and free from other signs of organic nervous disease. A history of longstanding inequality of the pupils with recent sudden increase in size of the larger one, of wide variations in the size of the larger pupil, or the discovery of hippus confined to the larger pupil are important diagnostic points. Occasionally tonic reactions in the smaller pupil give the clue to the nature of the larger "fixed" pupil. The combination of pupils of the kind under consideration with absent tendon reflexes, without other signs, in a young person, is strong presumptive evidence of the disorder. If persistent efforts to elicit tonic reactions have failed and a careful consideration of all the features of the case, age, sex, family and personal history, still leaves room for doubt, the appropriate tests to exclude syphilis must be made.

Diphtheria was suggested as the cause of the signs in some of my cases. Tonic reactions have never been recorded in this disease. The internal ophthalmoplegia of diphtheria is peculiar to it; there is true paralysis of accommodation, perhaps always bilateral and apart from very rare exceptions always isolated; it appears about ten weeks after the onset of the disease and recovery is always complete in a month or two. It never passes over into tonic accommodation (Axenfeld). True tonic reactions have never been recorded after encephalitis lethargica; no patient with tonic reactions has ever presented the early or late symptoms of this disease. A review of other conditions in which pupillary and tendon reflex signs may be found reveals none with which this disorder could well be confused.

Nature of the Disorder

We have seen that the tonic reactions are probably the expression of a unique kind of perversion of pupillomotor activity. Behr attributed them to a peculiar disturbance of the function of the vegetative portion of the third nerve nucleus. This notion receives some support from a consideration of the peculiar symptomless areflexia. Areflexia occurs in a number of disorders of the vegetative portion of the nervous system. Details are out of place here but it may be mentioned that in dystrophia myotonica and other myopathic atrophies the knee and ankle jerks are often lost in patients with powerful unwasted lower limb muscles and intact sensibility. Areflexia is also seen in Graves' disease, myasthenia gravis, family periodic paralysis and cataplexy, disorders in which

the peripheral nerves and central nervous system apart from the vegetative nervous system are so far as we know intact. When we know more of the functions, interrelations and affections of the ductless glands and the different portions of the vegetative nervous system we shall be on the way to an understanding of many disorders of obscure origin, including the one that concerns us here. In the meantime all we can say is that the ocular and reflex signs we have considered seem to be the expression of a kind of perversion of nervous activity of which, at present, we can form no conception.

Conclusions

The disorder characterized by tonic pupils and absent tendon reflexes manifests itself in several clinical forms; these can be referred to conveniently as complete and incomplete forms. The complete form is characterized by the presence of the tonic convergence reaction in a pupil apparently inactive to light and by absence or diminution of one or more of the tendon reflexes of the lower limbs. The incomplete forms present:

1. Tonic pupils alone.
2. Atypical phases of the tonic pupil alone.
3. Atypical phases of the tonic pupil with absent tendon reflexes.
4. Absent tendon reflexes alone.

In the atypical phases reactions are absent or difficult to detect. Most of the cases encountered in ophthalmological and neurological practice of ophthalmoplegia interna, ophthalmoplegia interna unilaterale, iridoplegia and partial iridoplegia for which no cause can be found are probably examples of an incomplete form of this disorder.

No known hereditary or acquired morbid factor plays any part in its production. In particular it has no relation to syphilis. It runs a benign course without the addition of further symptoms and is compatible with long life.

I take this opportunity of again thanking my colleagues at the Royal London Ophthalmic Hospital for their kindness in allowing me to examine cases under their care.

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CONTACT GLASSES

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RECENT interest in contact glasses would suggest that they are an innovation, but this applies only to the technical excellence of their manufacture for the conception of their clinical possibilities was perceived at least fifty years ago.

Historical

About the year 1879, Rählmann, concerned with the treatment of conical cornea, became dissatisfied with the crude lenses at that time in use and turned his attention to lenses having a hyperbolic curve. His improved results stimulated interest in the optical correction of conical cornea and in 1887 came the experimental work of Fick, which culminated in the production of the earliest contact glass.

Fick asked Professor Abbey, at that time a director of the Zeiss firm, if he could provide a contact glass having a corneal radius of 8 mm. and a scleral radius of 12 mm. by grinding. Four glasses were provided, but in 1889 Himmler pointed out that these glasses were not ground but had been skilfully manufactured by blowing.

Quite independently, in 1889, Müller, in his inaugural dissertation at Kiel, described his work with blown contact glasses which he had carried out in conjunction with Himmler.

Fick then obtained ground glasses with the corneal and scleral parts cemented together; the one piece glass appeared in 1892, manufactured by Benvist, Berthiot et Cie, and, almost at the same time, by Strubin of Basel. Müller himself had a myopia of 14 dioptres, which was reduced by contact glasses to 1·5 dioptres. He could not, however, wear them for longer than half an hour.

It was at this time recognized that the ideal combination of comfort and optical accuracy would be obtained by grinding a blown glass; many efforts were made, even to the breaking of 200 shells at one atempt, but these remained, and still remain unsuccessful.

The work of Sulzer on similar lines appeared in 1892. Thereafter, for the next ten years, further experiments were carried out, and in 1912 and 1913 appeared the work of Stock and v. Rohr.

A period of renewed interest followed productive of articles by Erggelet in 1913, with regard to the correction of aphakia, and by Siegrist in 1916 on the correction of conical cornea.

Both types of glasses were being used; in 1919 v. Hippel used the Müller type for conical cornea, and in 1922 Dohme described similar treatment by the Zeiss pattern. Deutsch extended the application to the treatment of irregular astigmatism in 1929.

From this time onwards, the clinical possibilities have been greatly amplified by Professor Heine, and the optical proofs thereof elaborated by Hartinger. In this country, the masterly writings of Rugg-Gunn have been extensively studied.

Physical Properties.—At the present time there are two types of contact glass in use, the blown type is an air-expanded capsule of glass which, although optically imperfect, is said to be more comfortable to wear. This was the type used in the early experiments.

The ground type, introduced in its present state in 1920 by Zeiss, is manufactured by cutting, grinding and polishing.

The Zeiss contact glass is described as consisting of two parts fused together, (*a*) a corneal segment, which is an arc of a sphere, having an inner radius varying from 5 to 11 mm. in 0·5 graduations, and (*b*) a scleral segment with a radius of 11 to 13 mm.

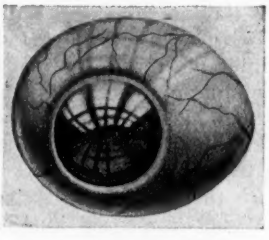

FIG. 1.

The Müller or blown type of contact glass.

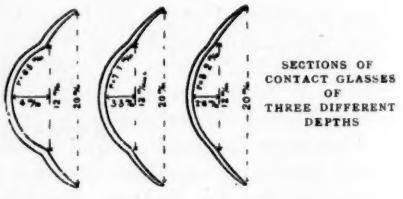

FIG. 2.

The Zeiss type of ground contact glass.

It is generally agreed with Professor Heine, that these measurements are insufficient, and that the graduations should run in 0·25 mm. The diameter of the corneal rim is 12 mm. and the entire diameter of the glass is 20 mm. The weight depends on the optical correction, which may be worked on the anterior face of the glass; it is usually about 0·5 gr. Hard crown glass, with a refractive index of 1·516, is used, and the shoulder between the corneal and scleral segments is carefully bevelled off.

When it is remembered that this thin wafer of glass is worked to 0·5 mm. measurements, the technical skill of the Zeiss firm will be readily appreciated, for the product is an optical accomplishment of the very highest order.

Physiological Properties.—If for any reason, the even curvature of the normal cornea be distorted, as by the abnormal shape of a conical cornea, or the irregular curvature resulting from the scars of ulceration, incident rays of light, instead of passing evenly through the mis-shapen cornea and coming to a point focus on the retina, become dispersed in several directions on account of the irregular refraction of the abnormal media (cornea) through which they pass.

True, if this refraction is moderate and regular in amount, they may be re-directed to their focus by the use of ordinary spectacle lenses but this correction has a limit, and beyond this limit, refraction and distortion are so great that spectacle correction is unable to produce a clear image on the retina.

There remain two ways of counteracting such irregularly refracting surface (1) to adapt a lens curvature to the abnormal curvature of the cornea by hyperbolic glasses, as has been done with success by Kramer. (2) To abolish the refracting power of the abnormal cornea, this is the function of the contact glass. Refraction is the property of a transparent medium suspended between two media of unequal refractive index, whereby rays of light, passing from the medium of less density, such as air, into a medium of greater density, such as water, are deviated from the path which they were pursuing in air to one of a different direction which they continue to follow in water. The cornea acts as a refracting medium, whether regular or irregular, because it is interposed between the air and the aqueous; if the cornea were to have a fluid of equal refractive index on either side of it, then its power of refraction would be abolished.

The principle of the contact glass is to maintain, on the outer side of the abnormal cornea, a layer of fluid, equal in refractive index to that of the aqueous humour, and by so doing, to overcome the distortion. Such a fluid is usually normal saline.

Thus it is seen that the contact glass is in no sense a lens, for it is afocal, and merely acts as a supporting structure to the saline

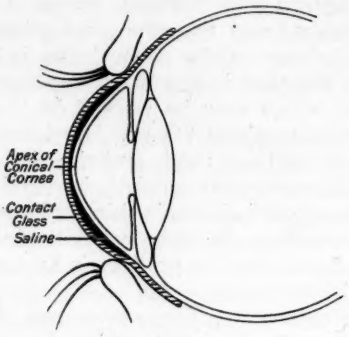

FIG. 3.

This Diagram shows the Contact Glass in position over a Conical Cornea, a layer of Saline intervening.

meniscus. The term "contact lens" should be reserved for those cases in which a lens addition has been ground on the anterior face of the glass. Furthermore, it will be realized that the whole function of this combination depends on the presence of a fluid layer between the glass and the cornea. The entry of air in the form of an air bubble nullifies the effect of the glass, and maintains the irregular refraction, resulting in no improvement in vision.

The exclusion of this air bubble is one of the first difficulties which the patient, on inserting the glass, has to overcome.

The final result of correction of irregular astigmatism by contact glass is a much nearer approach to normal physiological conditions than can ever be obtained by a spectacle lens.

Optical Properties.—The principle of contact glass correction is to render coincident the focal point of the compound lens system, consisting of contact glass, irregular cornea and intervening fluid meniscus with the far point of the eye.

Astigmatism, apart from that small portion due to the lens, disappears.

The value of this compound lens system may be altered by varying the curvature of the corneal segment, or by working a lens correction on the face of it, for example, a 5 mm. radius, with an average corneal radius, has a value of about 65 D. This value varies inversely until a radius of 11 mm. is reached, when the dioptric value is 30 D.

Thus, refractive errors may be corrected extending from a hypermetropia of 15 D. to a myopia of 20 D., the normal corneal radius being taken as 7·5 mm.

So, also, in the aphakic eye having such a radius, distance

focus is obtained by a glass of 6 mm. radius, and reading focus at a distance of 20 cm. by a glass of 5 mm. corneal radius (Heine).

Optical defects inseparable from a lens system having a fixed and moveable component, such as exists when a spectacle lens is supported before the eye, are excluded. These defects are (1) astigmatism of oblique pencils of incident light, causing chromatic and spherical aberration. (2) Limitation of the field of vision. (3) Changes in external accommodation. (4) Differences in the angle of fixation of anisometropic eyes. Furthermore, in the case of myopes, there is the advantageous magnification of the retinal image which at 20 D. amounts to 50 per cent. similarly, in hypermetropes, there is a diminution of the image at 17 D. by 10 per cent. (Hartinger.) Optical proofs of these deductions are to be found in the papers of Heine, Hartinger and Rugg-Gunn.

Psychological Properties.— The greatest psychological factor of contact glasss is their invisibility, which in women is of great importance, especially as they replace the thicker and more unsightly type of spectacle lens.

Advantages and Disadvantages.—It is tempting to wax enthusiastic over such a clinical innovation as the contact glass, but increasing experience has tempered such enthusiasm and come to show that, although the contact glass has fixed and definite functions, it is not the ophthalmological panacea some would have us believe.

The disadvantages may be annotated as follows: (1) an easy method of insertion, suitable for all patients, has not yet been found. (2) Discomfort is invariably experienced at first which, if the glasses are not accurately fitted, often leads to their discontinuance. Some patients at once become accustomed to them whilst others are afraid to persevere, and soon give them up. A successful case should tolerate the glasses for at least six hours. (3) They are costly (about £4 each). (4) They may be a potential source of danger to the eye in case of injury, though no such case has yet been recorded. Rugg-Gunn holds the view that this possible danger is less than that of a broken spectacle lens. Bearing in mind these disadvantages, it will, therefore, be realized, that the rôle of contact glasses is in those cases for which ordinary spectacles are of no avail, and where the alternative is blindness. They do not pretend to replace even the higher values of lens correction, though they hold theoretical advantages over such.

The advantages from the optical and cosmetic point of view have already been discussed. Suffice it to say that they bring to the treatment of conical cornea a method, the results of which have not been approached by any other previously employed.

Causes of Failure.—(1) Discomfort. This has been a difficulty from the very early days.

It is not universally agreed as to whether the contact glass is more comfortable when fitting tightly, or when there is a slight laxity of correspondence in movements between the eye and the glass.

The bulk of opinion, however, agrees that a tight fit with regular circum-corneal pressure is the ideal. Stock, on the other hand, wore contact glasses for two years, with a duration time of four hours, and puts the discomfort after this time down to the perfect fitting and close adhesion which had been obtained.

The middle course is taken by Professor Lindner who modifies the fit of the glass to the comfort of the patient, at the expense of exact optical correction.

The cause of this discomfort is probably not pressure on the surface of the cornea, so much as irregular pressure on the vessels and nerves at the limbus. Erggelet points out that the glass may be reground at these pressure points. This writer has made a careful study of the causes of irritation; he found that quartz lenses were just as irritating as those composed of glass, and that corneal damage, in the form of wreaths of pearls, may actually be caused by the pressure of the glass on the cornea.

von Csapody endeavoured to attain a perfect fit by means of a paraffin mould which is poured on the cornea and subsequently treated with ice-cold paraffin. He claims that no great trouble or harm comes to the patient, but that the subsequent plaster and metal preparation is a difficult process. He finds it useful for complicated cases.

von Hippel and Dr. Clausen have experience of shells made from zellon, a form of celluloid. The latter is of opinion that the tighter these fit the cornea, the more uncomfortable they are to wear on account of the suction action, which they acquire after being worn for a short time.

Most people are agreed that the Müller glass is the more comfortable to wear, probably because the unit area of pressure is less than that of the Zeiss glass. The best optical correction, however, is undoubtedly procured by the latter.

In my small experience the cause of this discomfort is partly lid-pressure forcing the glass backwards against the eye, and partly a slight amount of movement in the glass which allows the shoulder to ride on to the corneal surface. Pain can be produced at once in this way, by moving a contact glass in position slightly laterally. To overcome this difficulty, precautions must be taken to avoid too small a corneal radius, and to employ the liberal use of holocaine.

(2) Psychology. There are a certain number of people who will not entertain the idea of wearing glasses in such close contact to their eyes. There are also many cases who will not persevere with

the use of the glasses when fitted. An inaccurate fit probably contributes to their discouragement.

Dohme postulates the following properties of the perfect contact glass. (1) Perfect corneal curvature. (2) Graduated to a definite scale. (3) An accurate fit with no displacement. (4) Resistant to chemical action and invisible. (5) It must be possible to grind additional correction on the anterior face.

Indications

The best indications for the use of contact glasses are (1) cases of advanced conical cornea where spectacle correction offers no improvement, and where there is no great opacity of the corneal apex. (2) Cases of old corneal irregular ulceration where the ensuing scars have no great density. (3) Cases of neuro-paralytic keratitis where corneal anaesthesia has hitherto called for a tarsorraphy to prevent external injury. (4) Selected cases of higher refractive errors.

Professor Heine gives the following additional indications for the application of ointment in ulcus serpens of the cornea : sclerotic keratitis, acne rosacea, vernal catarrh, pemphigus, xeroderma, hay-fever, kerato-iritis, dystrophia marginalis and keratitis e lagophthalmo.

He has found them valuable in many cases of iritis, as a splint after plastic operations, in nystagmus and colour-blindness, and, when tinted, for cosmetic and climatic purposes.

In his extensive experience he has never observed any disadvantages with properly fitting and optically suitable glasses, and he is of opinion that a true curative effect may be obtained by a diminution of intra-ocular pressure, by direct pressure on the cornea, as in myopia.

Clinical Methods.—Contact glasses are now supplied in three sets, consisting of 53 glasses in all, enclosed in a galalith case from which they may be easily removed without scratching. At present the only special tint available is the "umbral" tint, though I understand that it is possible for any tint to be incorporated in the glass.

Having determined by routine ophthalmological examination that a case is suitable for the employment of contact glasses, one proceeds with the trial of these.

The first thing to do is to anaesthetise the cornea and conjunctival sac with 2 per cent. holocaine; this may be continued permanently if desired, although some patients eventually come to insert the glasses without any anaesthetic at all. Cocaine should not be employed owing to its deleterious action on the corneal epithelium.

One of the difficulties associated with the trial of a number of contact glasses is to have an easy method of insertion so that many glasses may be rapidly changed.

Another difficulty is that the patient is usually apprehensive and unable to hold the contact glass steadily without spilling the saline, and allowing the entry of an air bubble.

Thus it comes about that several methods of insertion have been recommended. They are (1) the older method, in which the patient separates the lids with the thumb and finger of the ipsolateral hand, and applies the contact glass, adherent by suction to a rubber pipette, held in the other hand. (2) The method whereby the glass is inserted directly, the face being immersed in water. This is favoured by American authors and has obvious disadvantages. (3) The method of Affleck Greeves, which is to oppose the contact glass until it is almost touching the cornea. The field is then flooded by means of saline from an undine, carried by an assistant, and at the precise moment the contact glass is allowed to touch the cornea. This method is successful but, unfortunately, it entails the presence of one, if not two, surgeons. (4) The method of O'Rourke, by which the contact glass is held rigidly in the stopper of a wash bottle, to which the patient approached and from which the contact glass could be released by air pressure. The principle of the method is excellent but the apparatus is unnecessarily clumsy.

Messrs. Hamblin have constructed apparatus which has proved to be most useful, especially for the rapid interchange of glasses.

This apparatus is very simple and consists of a cup-shaped rubber sucker supported on an upright standard which is fixed into a base-block. A small glass tube of narrow bore is fitted into the lower end of the sucker; to the other end of the glass tube is attached a small pressure bulb. Halfway up the standard is fixed a plane mirror, which may be rotated to left or right.

The technique of examination proceeds as follows: the pressure bulb is slightly exhausted and the contact glass having previously been immersed in a bath of warm normal saline, is placed on the sucker with the corneal segment adherent to the rubber, and the whole glass filled with warm saline.

Pressure on the hand bulb is now released and the glass remains firmly fixed. The patient separates the lids with thumb and forefinger of the ipsolateral hand, and leans vertically towards the rubber sucker, watching the approach of the glass to the eye in the mirror as he does so. When the saline impinges on the cornea, gentle pressure is made on the hand bulb, the glass is released and the lids allowed to slide over it. In this way the saline is not prematurely spilt.

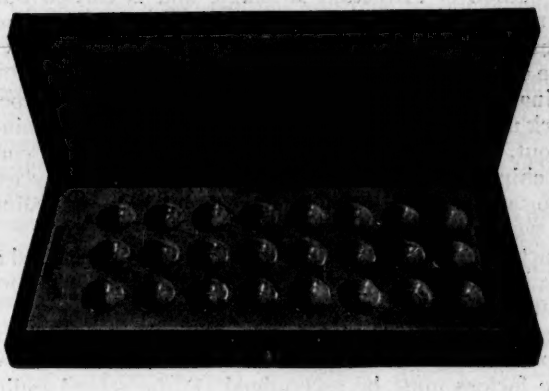

FIG. 4.
A Case of Contact Glasses (Zeiss).

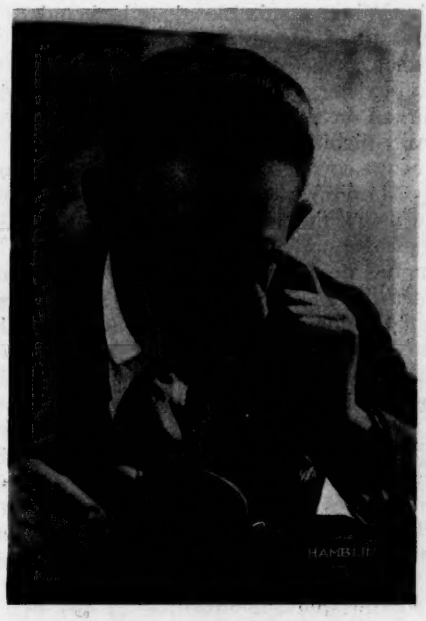

FIG. 5.
Apparatus for Insertion of a Contact Glass.

The method of extraction is simple and is carried out by opposing the sucker with the pressure bulb exhausted to the contact glass, and at the same time turning the head and eyes in the opposite direction.

Originally it was recommended to insert an ivory peg like a toothpick under the outer rim of the glass. Professor Heine rightly points out, that not only is this liable to damage the cornea, but it may chip or roughen the rim of the glass. In my experience an important practical point is that both glass and saline should be well warmed before attempting insertion.

Contact glasses should be taken out every night, dried and kept in a special galalith case provided, care being taken not to confuse the right with the left.

Prescription of Contact Glasses.—This is essentially the duty of an ophthalmic surgeon, and may not be delegated to an optician.

Three factors must be ascertained (1) the scleral radius. This is obtained by trial of glasses with varying radii until a zone of complete adhesion is seen beyond the limbus, this may be by slit-lamp or by direct inspection alone. (2) The corneal radius. This may be ascertained by an ophthalmometer, after Heine, or by direct trial. When a suitable glass is found, the residual refraction is determined by objective methods, and by means of a graph the exact correcting radius, incorporating the additional correction, can be determined. It is found that an addition of over 6 D. when worked on the anterior surface makes the glass heavy and liable to easy displacement.

The curves of the correcting contact glasses with internal corneal radii of from 5-11 mm. are traced in a right-angled system of co-ordinates in which the abscissa represents the radius of corneal curvature and the ordinate the additional correction.

Rugg-Gunn has devised a very useful rule for measuring the distance between the spectacle lens giving the residual correction, and the apex of the contact glass. With an extra addition of 4 D. this measurement must be stated on the prescription, in addition to the scleral and corneal radii.

If the discomfort is extreme after the holocaine has worn off, a more shallow corneal radius may have to be substituted.

When the prescription has been made up the patient should be instructed to use holocaine freely (combined with adrenalin) and not to wear the glasses for more than two hours at a time. I have not seen any ill-effects from prolonged use of holocaine. It is better to correct both eyes at once, otherwise troublesome diplopia is apt to occur.

The more comfortable the insertion of the glasses is in the early stages, the more is the perseverance of the patient stimulated.

As time passes, the duration of use may be extended, until a daily

period of eight hours is reached, in about three months. Much longer times have been reported and one patient is said to have fallen asleep in them.

Results.—By far the best results, in the use of contact glasses, have been obtained in conical cornea, hitherto incurable. Some will say that the contact glass is not a cure, but merely alleviates the symptom of defective vision. The proof of this assertion will require the observation of a series of cases before a decision can be reached.

Successful cases of conical cornea have been reported by Siegrist, von Hippel, Dohme, Heine, Hartinger, Rugg-Gunn, von der Heydt, O'Rourke, Derby, Deutsche, and Katz. Beaumont has reported a very successful case of high astigmatism, treated by these means.

On the other hand, Mamoli, after extensive experience, stresses the limited application, and Wassemaar quotes four cases none of which was able to tolerate them for more than six months. Anderson states that his patient inserts the contact glass dry, and that the air bubble obtained causes no inconvenience. This is probably because tears percolate under the glass and gradually replace the air.

The following case is reported after having been under observation wearing contact glasses for nine months, and may thus be said to have reached a stage of conclusion.

Case Report

Four years ago, Miss T., aged 24 years, had four dioptres of astigmatism in each eye, which, when corrected, improved her vision to 6/18. Glasses were prescribed and she was kept under observation as a case of possible conical cornea.

In 1931 the vision with her glasses had sunk to 6/60 in both eyes, and the astigmatism had increased to about seven dioptres. Bilateral conical cornea without apical opacity was well established, and the patient was having the greatest difficulty in carrying on her work as a baker.

In August, 1931, contact glasses were fitted. The vision of the right eye was improved to 6/7·5 with a +1·0 sphere added, and that of the left eye to 6/7·5 (part) with a −1·0 sphere added. Her uncorrected vision was, R. E. 1/60 and L. E. counts fingers. Using both eyes together, fitted with contact glasses and no spectacle lens correction, her vision was normal.

At first she had some difficulty in avoiding the air bubble on insertion. This has been overcome and she is able to wear her glasses with comfort for eight hours, but she is being limited to six hours at the present stage of her treatment.

She is able to detect the presence of the air bubble by the diplopia which it produces.

Examined seven months after continuous use, her vision remains the same, and she is able to pursue her work in a normal fashion.

This case was made difficult by the fact that the patient was highly strung, and had been made desperate by the prospect of life-long blindness.

I wish to express my sincere thanks to Mr. Duke-Elder and Messrs. J. & A. Churchill (Publishers) for the use of the block for Fig. 1, and to Messrs. Theodore Hamblin for the courtesy and assistance which they have always been ready to extend in connection with this work.

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THE CONTACT GLASS AS AN AID IN CORNEAL PLASTIC SURGERY

BY

LT.-COL. R. E. WRIGHT

THE value of the conjunctival flap in dealing with wounds and ulcers of the cornea and limbus, whether perforating and liable to uveal involvement or non-perforating, is generally recognised. The method has proved of greatest service perhaps in the treatment of ulcers followed by iris incarceration. Descemetocele, or fistula, and wounds, non-operative or operative associated with iris prolapse, *e.g.*, prolapse following a cataract operation.

According to the nature of the condition treated the conjunctival flap may be expected to act either temporarily as a protective covering or permanently as a graft. An example of the former is the covering obtained by making a complete circumcorneal incision of the conjunctiva, undermining it, and drawing it over the cornea by a purse-string suture. In vascular conditions of the cornea such a flap may behave as a graft and do much harm by forming an undesired adhesion. In the latter category the apron flap used near the limbus to cover a corneo-scleral defect, *e.g.*, a cataract section with or without prolapse of iris, is usually intended to act as a graft, becoming permanently attached and forming a sound protective covering for the defect.

In perforating lesions towards the pupillary area of the cornea, *e.g.*, a post-ulcerative perforation with iris incarceration and fistula, a permanent covering of the defect by an adherent flap or graft is desirable, but operators with considerable experience are frequently chagrined to find that their best efforts by ordinary methods, such as the pedicle or bridge flap, result in a temporary covering where a permanent one was intended. No doubt such a protective strip of conjunctiva sometimes allows healing to take place under it thus achieving the desired result, but this does not alter the fact that in many cases successful grafting is essential for the best results. With this end in view, towards the end of 1931 I tried several unorthodox methods, some of which at least extend the sphere of usefulness of plastic surgery as applied to the cornea. One of these was adopted in the case of corneal fistula following ulcer in the pupillary area. The patient, a pregnant woman, was expecting delivery in a few weeks, and it was desirable to get a sound closing of the aperture before she left for her confinement. The neighbourhood of the opening was first prepared by carefully destroying the epithelium of the aperture and that for some distance around by a light application of a fine electro-cautery

point. For this purpose a useful cautery handle is that made for me by Messrs. Down Bros. which resembles a stylographic pen in shape and can be similarly used. The flex leading to a switch operated by knee or foot, takes off from the middle of the handle towards the palm of the hand, thus eliminating drag and rendering delicate touch possible. A pedicle ribbon flap 6-8 mm. wide was raised from the upper bulbar conjunctiva in a transverse direction, one edge of the flap being concentric with the corneo-scleral junction and about 5 mm. from it. To facilitate getting a very thin flap, ballooning the conjunctiva by an injection of novacaine solution is useful. A ribbon flap is thus easily cut with a cataract knife. The defect in the conjunctiva was next closed by a few points of very fine suture. A continuous suture for this purpose would do equally well. The flap was then laid over the cornea and stretched out thin and level over the raw area, its free end being buried in a subconjunctival pocket made at the limbus at a point diametrically opposite its attached end. A fairly flat contact glass was then applied which held the flap stretched in position. It was not removed for seven days but the flap was very carefully inspected through the glass from the second day onwards. On the fourth day it seemed that the flap had failed to take as its end was free inside the concavity of the glass. On removing the glass carefully three days later it was seen that the graft had taken, immediately over the prepared area. The unadherent flap was carefully cut away and although the attachment was of a very delicate nature, the lids were closed without replacing the glass, covered with ointment lint and both eyes bandaged. A good sound graft was assured by the tenth day which enabled the patient to leave hospital with a safe eye and return after her confinement with a good firm scar, for further observation as to optical treatment. A modification of this method in which a free conjunctival ribbon flap was tried did not succeed. The ends of the flap were at first gripped by the contact glass where they crossed the limbus and extended out on the bulbar conjunctiva but they came free before a "take" was effected. The ends of the ribbon would have been more secure had they been buried in subconjunctival pockets at the limbus on either side.

A third procedure gave an excellent result. Instead of using a conjunctival graft a thin epithelial ribbon was taken from the inner side of the arm. This was laid out evenly over the prepared floor of the ulcer, the ends of the ribbon being buried beneath the limbal conjunctiva at either end of the 45 degree diameter. A contact glass was then placed in position. In this case as the edge of the ulcer base was situated within a few mm. of the limbus, not only was the floor of the ulcer cauterized and its edges denuded of epithelium, but a track of cornea leading from this edge to the limbus was similarly denuded. This has been my routine practice

in any conjunctival flap procedure where the portion of the cornea between the lesion and the limbus may reasonably be sacrificed as it gives the graft a much better chance of vascularisation. Even in defects near the centre it is advisable to raw a narrow track of cornea in the proposed axis of the ribbon flap on one or both sides of the defect.

The epithelial graft placed as above described adhered soundly to the raw area and the glass was removed on the seventh day. It was then found when trimming off the excess of graft that it had also adhered firmly to the episclera in the pockets and this had to be carefully removed. The result was excellent, the small rounded patch of epithelium which covered the old ulcer soon became smooth and moist.

This modification, grafting with skin instead of conjunctiva, has some very obvious advantages and is worthy of consideration and further development. Possibly the idea is not new but as far as could be ascertained at the time, the method adopted was original. The actual technique might be improved so as to avoid adhesion of the buried ends of the ribbon. Instead of a contact glass a small thin paraffin shell adapted in size and shape to the cornea might be used, placing in its concavity an epithelial graft somewhat larger than the defect to be covered, and the whole held in place by means of raising a complete concentric conjunctival flap at the limbus and drawing it together over the shell with a purse-string suture. A detached graft lining a paraffin shell of the same size as an ordinary glass eye is obviously unsuitable for corneal work, but is excellent for defects of the conjunctival fornices, whether mucous membrane or skin be used. In fact paraffin of a suitable melting point is invaluable for the making of shells and forms to carry all manner of grafts in connection with conjunctival plastics.

When experimenting with contact glasses as an aid to grafting, it occured to me that they could also be used in the treatment of corneal ulcers, in order to maintain an antiseptic agent in effective strength in contact with the lesion, *e.g.*, iodoform. This was tried but my experience of the method is insufficient to justify an opinion as to its value.

OPTICAL IRIDECTOMY, INDICATIONS, METHOD AND VALUE

BY

J. FOSTER, F.R.C.S.

WEST HARTLEPOOL

ONE attraction of Ophthalmic Surgery, a compensation for its fickleness, lies in the sight-giving operations, lens extraction, and optical iridectomy, which are more dramatic in their results than those say for chronic glaucoma which are but a brake on a progressive disease.

Since its inception by Wenzel in 1871,[1] different writers on optical iridectomy,[3,4,9] have mentioned that results are not so good as the mechanics of the operation might suggest. I have been unable to find in the literature, however, any series of cases that stress this or show just how much benefit one may expect. The 35 cases summarised in this paper represent four years work by the surgeons of the Royal Westminster Ophthalmic Hospital. No out-patient notes are available before this time.

Indications

The cases in which operation is indicated must have a percipient retina and can be divided into two classes.

1. *Optical Obstruction* only, of the pupil by opacities of the cornea or lens, more rarely by keratoconus, and dislocation of the lens.

2. *Pupillary Deformation* where the pupil is deformed by synechiae.

   (*a*) Occlusio and seclusio pupillae with an intact lens form one group, and

   (*b*) Drawing up of the pupil to the section after lens extraction forms the other.

In group (*a*) secondary glaucoma may provide an additional indication for iridectomy. Group (*b*) is dealt with by iridotomy as a rule. In the four cases included an iridectomy proper was performed.

In Class I the opacity should be of a stationary nature. An exception to this may be made in ophthalmia neonatorum. Here it is customary to wait until the child is weaned to see how

much will absorb. If, however, it is very dense and extensive, the operation may be performed as early as two months of age to prevent the onset of nystagmus. This complication, unfortunately, usually arises in the first six months of life, and rarely after two years. Iridectomy is much better as a prophylactic than as a cure. Where the opacity is progressive, as in cases where a preliminary iridectomy is performed for senile cataract, the optical effect is negligible, and out of 72 such cases in the past four years, not one shows any visual improvement. The opacity should of choice, be small, dense, and not surrounded by a nebulous area whether lenticular or corneal. In the lens, only small, axially situated, lamellar (or "Coppock") cataracts with a vision of less than 6/18 are suitable as a rule. Anterior polar cataracts rarely interfere enough with vision; large lamellar cataracts occupy all but the periphery of the lens and require discission. Should no definite improvement in vision occur after a week's mydriasis, operation is contra-indicated. This test excludes cases with partly transparent opacities, insufficient clear cornea or lens, or defective retinae. Lamellar cataracts that do not improve to 6/18 at least, should also be considered unsuitable.

The site of election for the coloboma is "down and in." This is alleged to be the area nearest to the visual axis. As the visual axis is in actuality 5° "up and in," this site has probably been chosen empirically, and for cosmetic reasons. Frequently, the clearest portion of cornea as determined by ophthalmoscopy of the details of the optic disc is in another quadrant. The coloboma is then sited preferentially behind this. Even when the only available clear area is behind the upper lid, the coloboma may still be of use as the lid may be tonically raised to obtain a little vision if the sight is bad in the other eye. The lid may even serve to cut down dazzling. Where both eyes are defective a tenotomy of the superior rectus may place the clear area opposite the palpebral fissure. [10] In a lamellar cataract, the best situation may be found by rotating a pear shaped stop $2{\cdot}5 \times 1{\cdot}5$ mm. in front of the dilated pupil. [4] More ingenious variants of the same principle are a contact glass with a transparent sector,[6] and a piece of black paper with a sector cut out and made adherent to the cornea by grease. [14] The inventor of the latter method corroborates his results so obtained by an eccentric mydriasis. Injection of 0·3 c.c. of a standard solution of adrenalin or m. ii of laevo-glaucosan (against which are strict injunctions on the leaflet) under the conjunctiva near the limbus, will produce an initial, local dilatation of the pupil towards the injection, giving the same optical effect as a temporary coloboma.

Method

Class I.—There is a choice of three operations[10].

(1) Ectomia ex Iride cum Sphincterectomia.

(2) Ectomia ex Iride Simplex.

(3) Iridoto-Iridectomedialysis.

In method (1) the coloboma should be narrow, continuous with the pupil, uncovering lens only and not the zonule. If its outer limit can be kept within the "collarette" and yet not be covered by the opacity so much the better. It is made by a keratome incision just inside the limbus, withdrawing the iris by traction directly on the pupil margin wih forceps or an iris hook, and excising the iris with de Wecker's scissors held radially. Pre-operative miosis will shorten, and mydriasis lengthen the slit produced.

This operation is useful in the small central corneal opacities, but is specially indicated in lamellar cataracts and to increase the lens-free area of the pupil in congenital dislocation of the lens.

Method (2) is used in larger corneal opacities with a very dense centre and a less dense periphery. A small area of iris is withdrawn through a keratome wound with Hess's forceps from behind the clear area of cornea and excised, leaving the sphincter intact. The dense central area obviates uniocular diplopia.

Method (3) is employed where a small sickle-shaped area of cornea alone remains clear. Irido-dialysis is produced by insertion of a narrow keratome near the centre of the corneal scar, the iris being seized about 1 mm. from the limbus, gradually drawn out with an oscillating movement and divided. This operation which is very similar to one devised by Mayou for adherent leucomata, has very little effect from the optical point of view, and its value is mainly therapeutic.[10]

These operations may be done under a local anaesthetic in the adult if cocaine is inserted frequently for 20 minutes, but are painful at moments of tension on the iris, and are more easily carried out under general anaesthesia.

Tattooing may be employed as an adjunct to optical iridectomy, and its probable efficacy in a given case estimated by application of black paper to correspond with the area to be tattooed.[8] It is extremely rare for anything but a cosmetic effect to be produced.

Class II A.—The problem here is to remove the iris without producing a traumatic cataract. It has been suggested with this danger in mind that the iridectomy be made at "12 o'clock" where it would assist a subsequent cataract extraction.[5] Apart from adherent leucomata where the method of Mayou[13] is indicated, there are three methods available.

(1) Iridorrhexis (Desmarres) consists of tearing away the iris near the pupillary margin with forceps, and, if possible, excising it. Margennis[12] describes a good result from this method. As the iris is friable it is difficult to get a good purchase on it, and in addition the pigment layers may remain adherent to the lens. When the iris is "bombé," it is the flattest and apparently most suitable areas that suffer from this disadvantage. Where the bulging forward of the iris is very marked, Fuchs' transfixion operation may have to be done to render an iridectomy feasible.[7]

(2) The method ascribed by Grimsdale to Brudenell Carter.[8] This requires insertion of Carter's scissors through a keratome wound opening the blades flat against the iris, and snipping off the bulge rising between them. Two satisfactory cases are described by this author.

(3) Where the lens may be cataractous and shrunken as in old "sympathising" eyes, a conjunctival flap and keratome incision may be made as for anterior sclerotomy "up and out." The sharp pointed blade of de Wecker's original scissors is then introduced through this, pushed through and behind the iris and across the face of the lens. The blunt-ended blade is in the anterior chamber, and when the instrument is closed an oblique slit in the iris is produced. Case No. 30 was dealt with in this way producing an adequate pupil. The lens remains to be dealt with.

Group II B.—Iridectomy should not be attempted for a year after the lens extraction, when uveal inflammation has subsided, as shown by absence of endothelial oedema of the cornea.

An incision is made at "six o'clock" just inside the limbus with a Taylor's knife. This is passed vertically upwards about 2 mm. across the anterior chamber, then through the iris and up behind it into the drawn up pupil. The knife is withdrawn and a malleable hook passed along its track, until it engages in the pupil margin which is drawn outside the wound, and the iris divided with de Wecker's scissors. For convenience in manoevering the hook, the shaft should be bent at right angles before insertion as suggested by Sir Richard Cruise. A large vertical opening is thus produced, but even this may contract down, and the operation also suffers in common with iridotomy the disadvantage of unabsorbed haemorrhage into the vitreous, hernia through the new pupil, and opacities into the vitreous behind from preceding inflammation.

Results

To assess results, cases must be divided into two classes. Operations of "Election," where vision in the other eye is good, and operations of "Necessity" where vision in both eyes is poor.

CLASS I *12 cases.*

Elective 5 cases. Improved, none.
Necessitous 7 cases. Improved, Nos. 1, 8, 10.

CLASS IIA *19 cases.*

Elective 5 cases. Improved, No. 26.
Necessitous 3 cases. Improved, Nos. 14, 19, 23 temporarily.
No. 28 slightly.
Nos. 31, 27, 18 greatly.

CLASS IIB *4 cases.*

Necessitous 4 cases. Improved, Nos. 33 and 34.

That is to say of 10 "Elective" cases, only one showed any improvement and that but slight. Since every operation of this nature exposes the sound eye to a risk admittedly remote of sympathetic ophthalmitis, and the bad eye to the possibility of dazzling or uniocular diplopia, it is suggested that to avoid unnecessary operations in Class I, "considerable" improvement be insisted upon when the pupil is dilated, before operation be performed. As a standard, an improvement of H.M. to identification of the letters of "6/24" Snellen at 2 feet is suggested as compatible with the word considerable. Uniocular lamellar cataracts, which are extremely rare, might be considered under this standard instead of that demanded for the bilateral variety. Mayou[13] has already pointed out that if vision in one eye is good, the most that can be hoped for by operating on the other is "increased vision for large objects." It might here be pointed out that the vision after optical iridectomy may continue to improve for two months after operation, as the patient gets used to the coloboma.

In assessing the visual results in the "necessitous" cases one must consider, in addition, factors other than the visual acuity.

Lawson[11] has pointed out that the merest scintilla of sight may be a disadvantage to a man who would otherwise be reconciled to stone blindness. At the same time an increase in vision from *P.L.* to counting fingers may make an enormous difference to a determined individual. In general the value of the operation to the patient varies inversely as his pre-operative visual acuity, and directly as his applied intelligence. In the most successful cases functionally in Class II, the highest recorded final vision was 6/36, but in some of them an increase to 6/60 was enough to change the patient's mode of life completely. 9 cases out of 30 in the "necessitous" class showed some improvement. Butler[2] has said of this class that the most one can hope for is to give enough sight for the patients to get about.

In general, in this series, the least successful are the cases of corneal opacity. The most successful visually, are lamellar cataract, and functionally occlusio pupillae.

Of the whole series, 9 out of 35 showed varying degrees of permanent improvement.

The highest permanent vision produced by the operation was 6/24. In Class II *B*. the results produced by iridectomy were rather better than those in the nine cases of iridotomy, performed for the same condition during the same period. I have been unable to include a case of ophthalmia neonatorum as the only case on which optical iridectomy was performed during this period was that of a mentally deficient child whose vision cannot be estimated. It does not appear to be improved.

Results in general in ophthalmia neonatorum are most disappointing; this is unfortunate as they are almost always of the "necessitous" type. The highest visual acuity obtained in such a case that I have been able to ascertain is 6/36.

My thanks are due to Mr. Grimsdale and Mr. McMullen for revising this paper, and to the surgeons of the Royal Westminster Ophthalmic Hospital for permission to publish these cases.

Class I

O.I.=Optical Iridectomy

1. Aged 55 years, *Tool setter*. Developed pannus of unknown aetiology that partly covered pupils from 7 years of age. Learnt his trade while both eyes were atropinised. Developed mydriatic irritation. Double optical iridectomy enabled him to carry on for 2½ years more; until the present curious superficial keratitis covered both iridectomies.

2. Aged 73 years. Corneal ulcer lasting a month.
   Rt. Lens opacity 6/36.
   Lt. Adherent leucoma. Good projection O,I. Not improved.

3. Aged 17 years. Scholar. "Eyes were bad following whooping cough."
   Lt. Phthisis bulbi.
   Rt. Cornea nebulous. H.M. Optical iridectomy attempted. Not improved.

4. Aged 49 years. Housework. Interstitial keratitis and choroiditis 13 years ago.
   Lt. Nebulous cornea. Old k.p. pupil normal H.M.
   Rt. ,, ,, ,, ,, ,, ,, ,, O.I.
   Less than 6/60—no improvement recorded.

5. Aged 26 years. Ship's steward. Knocked his eye on a ship's bolt.
   Rt. Normal 6/9.
   Lt. Large nebula. H.M. at 1 foot. O.I. Not improved.

6. Aged 50 years. Labourer. Herpes ophthalmicus.
   Rt. Dense leucoma; superficial vascularisation 6/60. O.I. Not *improved.*
   Lt. Amblyopic since birth 6/60.

7. Aged 47 years. Cracker maker. Silver nitrate and nitric acid mixture boiled up into his eyes, 1 year ago.
Rt. Symblepharon, dense corneal opacity below and axially. Counts fingers 1 ft. O.I. Not improved.
Lt. Dense opacities below and to temporal side, cornea clear above. C.F. 2 ft. O.I. Not improved.

8. Aged 52 years. Civil servant. Ten years failure of sight.
Lt. Lamellar cataract. 3/60. O.I. 6/24.
Rt. ,, ,, 6/24. O.I. 6/36.

9. Aged 26 years. Gardener. Corneal ulcer in third week of smallpox.
Rt. Normal. 6/6.
Lt. Dense leucoma. Good projection. O.I. Not improved.

10. Aged 58 years. Farmer. Recurrent corneal ulceration.
Rt. Vascularised nebula. H.M. O.I. 6/24.
Lt. ,, but less dense nebula. H.M. O.I. 6/60.

11. Aged 32 years. Clerk. Four months corneal ulceration.
Lt. Normal 6/5.
Rt. Dense leucoma. C.F. at 1 ft. O.I. C.F. at 18 ins. No improvement.

12. Actor. Corneal ulcer requiring peritomy 2 years ago.
Lt. Normal 6/9.
Rt. Dense vascularised nebula. C.F. at 2½ ft. O.I. "Diplopia and haloes round lights." C.F. at 1½ ft., but "feels that sight is improved."

Class II*a*

13. Aged 40 years. Jeweller. Recurrent iridocyclitis.
Rt. Partial seclusio pupillae. 6/24. O.I.
Lt. Seclusio and occlusio pupillae. Bare P.L. } Not improved.

14. Aged 66 years. Teacher. Scleritis 45 years ago.
Rt. Corneal opacities and post synechiae < 6/60.
Lt. ,, ,, ,, ,, ,, 6/36. O.I. 6/24 later fell to 6/60.

15. Aged 56 years. Porter. Iridocyclitis 20 years.
Rt. A little débris in pupil. 6/9.
Lt. Occlusio pupillae. P.L. O.I. Not improved.

16. Aged ? years. Housework. Two years recurrent iritis.
Lt. Post. synechiae. 6/9.
Rt. ,, ,, 6/60. O.I. Not improved.

17. Aged 38 years. Tuberculous iridocyclitis and phthisis 8 years.
Lt. Exudate and new blood vessels in pupil. Poor projection. O.I. Not improved.
Rt. ,, ,, ,, ,, ,, ,, ,, Good projection. O.I. Not improved.

18. Aged 48 years. School teacher. Eight years ago tuberculous iridocyclitis and corneal ulceration.
Lt. Dense leucoma, post. synechiae. Poor projection, O.I. Not improved—later excised.
Rt. Dense leucoma, post. synechiae. Good projection. O.I. < 6/60. "But able to get about which she has not done for years. Very grateful."

19. Aged 11 years. School boy. Attending hospital since 4½ with interstitial keratitis.
Rt. Big nebula covering seclusio pupillae < 6/60. O.I. '29 6/18.
Lt. ,, ,, ,, ,, ,, < 6/60. O.I. '29 6/36.
'31 sight has since failed. ? Retinal detachment and now can just tell night from day.

20. Aged 34 years. Housework. Perforating wound 24 years ago.
Rt. Normal eye 6/5.
Lt. Adherent leucoma. P.L. O.I. Not improved.

21. Aged 56 years. Housework. Iridocyclitis both eyes 1 year ago.
Lt. Large corneal leucoma. C.F. at 2 ft.
Rt. ,, ,, ,, C.F. at 2 ft. O.I. Not improved.

22. Aged 71 years. Labourer. Iridocyclitis.
Lt. Phthisis bulbi.
Rt. Seclusio pupillae. H.M. at 2 ft. Optical iridectomy. H.M. vectis extraction of lens with iridectomy R.V.=P.L.

23. Aged 42 years. Labourer. "As an infant had inflammation of the eyes."
Rt. Extensive ant. staphyloma. P.L., later excised.
Lt. Central corneal nebula and post. synechia 6/60. O.I. 6/36 but later fell to 6/60.

24. Aged 28 years. Housework. Iridocyclitis (? tuberculous) 4 years ago.
Rt. Diffuse corneal haze, iris bombé C.F at 1 metre. Operation, 6/60.
Lt. ,, ,, ,, ,, ,, H.M. Operation, 6/60.

25. Aged 52 years. Hotel porter. Several attacks of iritis during 10 years.
Rt. Small nebulae and almost complete seclusio pupillae. Vitreous opacities 4/60 operation, C.F. 2 ft.
Lt. Small nebulae. Post. synechiae. Contracted field 6/36 operation, not improved.

26. Aged 62 years. Labourer. Hypopyon ulcer 9 months ago.
Rt. Normal eye 6/9.
Lt. Leucoma and post. synechiae < 6/60 operation. "Peripheral vision improved."

27. Aged 31. Knitter. Interstitial keratitis at 8 years of age.
Rt. Seclusio and occlusio pupillae. Transverse calcareous band C.F. at 6 in. operation, C.F. at 1 ft.
Lt. Seclusio and occlusio pupillae. Transverse calcareous band H.M. operation, 6/60 "Is able to get about better and was able to read a letter. She has not done this for years."

28. Aged 26 years. Blind school boy. Old interstitial keratitis.
Rt. Hazy cornea. 6/36 operation, 6/36.
Lt. ,, ,, Iris bombé. 6/60 operation, 6/36.

29. Aged 51 years. Housework. Old corneal ulceration.
Lt. Adherent leucoma. 6/60 operation, 6/36.
Rt. Normal eye. 6/5 partly.

30. Aged 16 years. Blind school. Perforating injury of L. eye when a child. "Sympathetic" in L. eye.
Lt. Phthisis bulbi.
Rt. Corneal calcareous opacity. Occlusio pupillae. T.—1, H.M. at 6 in. Iris divided by de Wecker's scissors inserted through a keratome wound. Lens now visible.

31. Aged 19 years. Knitter. Old interstitial keratitis.
Lt. Dense corneal opacity chiefly central. Iris bombé H.M. Iridectomy 6/36 and J.2 at 4 in.
Rt. Dense corneal opacity chiefly central. Iris bombé H.M. Iridectomy H.M. "The operation enabled her to get about. Both eyes have been trephined since."

Class II*b*

Complicated after cataract

32. Aged 66 years. Housework Old glaucoma and lens extraction. July, '31.
Lt. Anophthalmos.
Rt. Pupil drawn up and capsule unchanged by capsulotomy P.L. October, 1929. Iridectomy, leaving a fair sized pupil, C.F. at 1 metre. Pupil contracted, March, 1930. Iridectomy. No elasticity in iris at all, tore on insertion of hook leaving a vertical slit that soon closed. Doubtful P.L.

33. Aged 49 years. Carpenter. Tuberculous iridocyclitis 2 years.
Rt. Post. synechiae and cataract. H.M. (Active iridocyclitis.)
Lt. ,, ,, ,, ,, C.F. at 9 ins. June, 1931. Lens extraction. Pupil drawn up to section. V.=P.L. August, 1931. Iridectomy, V=6/60. "Patient can get about by himself. Had previously been signed up as a blind person at another hospital and told nothing could be done."

34. Aged 48 years. Violinist. Recurrent iritis, iridectomy 6 years ago.
Rt. Post. synechiae, lens opacities. C.F.
Lt. ,, ,, Pupil blocked wiih exudate, opaque lens. H.M. March, 1931. Synechia divided. Lens extraction. Pupil subsequently pulled up. =C.F. at 3 ft. February, 1932. Iridectomy. Good pupil. 6/36 and J.14. Retinal and choroidal haemorrhages. Much improved visually.

35. Aged 76. Housework. Rt. lens extraction. January, 1931. Delirious after operation. Prolapse.
Lt. Lens opacities. 6/18 later fell to 6/60.
Rt. Old prolapse, pupil drawn up and contains exudate. November, 1931. Iridectomy. Good opening made but blood stained vitreous blocks it, and it is contracting. Good projection.

In all cases quoted above the vision is the best obtainable with correction.

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Since writing this paper another article on the subject has come to my notice.[15] The author, Roche, quotes cases in which the cornea cleared to a surprising extent, and the artificial coloboma was a liability to the patient by reason of the dazzling produced. This occurred although the operation was technically perfect when originally performed. He emphasises that although an eye might see better with an iridectomy, it is the patient's ultimate benefit and not this alone that should be considered in deciding for or against operation.

PROGRESSIVE MYOPIA

A Suggestion explaining its Causation, and for its Treatment

BY

J. P. SPENCER WALKER

HOVE

ABOUT five years ago I had an idea that progressive myopia might be a "deficiency" symptom. In the year 1928 my colleague at the Sussex Eye Hospital Mr. C. G. Schurr suggested "that there were very good grounds for believing that the cause of myopia might be found in a consideration of aberration of growth in children." This fortunate coincidence encouraged me in my investigations. My ideas were somewhat as follows:—

1. In myopia the globe of the eye is elongated, and in progressive myopia this elongation presumably increases. The sclera therefore must be stretching. As there is no hint of an increase of tension within the globe, it follows therefore that the sclera itself cannot be as tough and resistant to expansion as in the normal eye, and that this "weakness" must be evenly distributed throughout. In cases of staphyloma we find that there has been a local "weakening" and stretching of the sclera, and in total ectasis the stretching is general. If therefore we can demonstrate that the sclera in myopia is weakened, here is a link in the chain to explain the elongation of the globe in myopia. It has been suggested that the ocular muscles pull on the globe, thereby assisting in the elongation, this pull being due to an abnormal correlation between accommodation and convergence. This suggested that the treatment required is a full correction of the error of refraction by the constant use of concave lenses. But it is obvious to all of us that in spite of such correction the myopia increases in many cases. Progressive myopia therefore must be influenced by some more general condition.

2. Progression is mostly to be found during adolescence, which is a period of stress to the child, who is growing rapidly, and whose internal secretions are undergoing changes.

3. In the majority of cases progression appears to stop spontaneously when adolescence ceases, in other words in the early twenties.

4. In a great number of these cases there is an aberration of growth of the body. The weight of the child in not increasing proportionately to the height (*cf.* paper entitled "Myopia in Childhood." C. G. Schurr.)

5. In some of the cases under my care dental caries was present and I was told by the parents that the dentist had stated that in his opinion the child was suffering from calcium deficiency.

This latter statement taken together with the increase in the length of the long bones, due to growth, suggested to me a possible explanation of our question. If the bones are growing rapidly, they require calcium. Is progressive myopia a symptom of calcium deficiency? I asked therefore the doctors who had sent me myopic children for refraction and the prescription of glasses, to give them calcium for long periods. I started this administration of calcium about three years ago, and the results have been both suggestive and promising. To illustrate my investigations I will describe briefly three typical cases:—

I.—The first case saw me in September, 1924, he was then aged 13 years. His vision was right eye 6/36, left eye 6/36. The refraction was −3·50 D. Sph. in each eye. I ordered him these lenses for constant use, and with them his vision was 6/6 with either eye. In 1925 his vision and refraction remained unchanged. He was not growing rapidly, in fact hardly at all. In January, 1926, his vision with his glasses was now 6/6 partly with either eye, and the refraction was −4·50 D. Sph. in each eye. I ordered him fresh lenses, which again brought his vision up to 6/6 with either eye. I now forbade him to bicycle up hills, or to play games which entailed stooping with exertion. In short the usual precautions in progressive myopia were taken, if one held the view that the pull of the ocular muscles during convergence influenced the progression. It was found possible to send him to a special school, where individual attention could be given to each boy, and I encouraged the parents to send him there, which they did. In April, 1926, his condition was unchanged. In September, 1926, his myopia had increased to −4·75 D. Sph. in each eye. In spite of all precautions, which included the prescription of the full correction of his refractive error, his myopia increased, and in January, 1931, his refraction was −5·25 D. Sph. in each eye. I then lost touch with him, as he had moved to London. In this case the boy did not grow rapidly until 1926, when he was 15 years of age. Up to this date the myopia was controlled by the correction of his error by suitable lenses. When he began to grow rapidly, his myopia increased in spite of our precautions. No calcium was prescribed.

II.—The next case is a boy, aged 15 years. He first saw me in December, 1929, and his error of refraction was right eye −2·0 D. Sph. left eye −2·25 D. Sph. His height was 4 feet 11½ inches, and his weight 6 st. 11 lbs. I ordered him the appropriate glasses, with which he saw 6/6 with either eye, and I also ordered him Calcium and Parathyroid (P. D. & Co.) by mouth. In July, 1930, his height was 5 feet 0¼ inch and his weight 7 st. 7½lbs. and in December, 1930 his height was 5 feet 2⅜ inches and his weight 8 st. During this time his refraction remained unaltered, and his

vision with his glasses was still 6/6 with either eye. He then had an accident, another boy pushed him over and he broke his spectacles, a piece of glass entering his left eye. Fortunately his globe was not perforated. In April, 1931, his height was 5 feet 3½ inches and his weight 8 st. 9 lbs. His refraction was right eye -2·50 D. Sph. and left eye -2·50 D. Sph. -0·50 D. Cyl. vert., an increase of half a dioptre in his myopia. The astigmatism, I feel sure, was due to the healing of the wound, which was near the limbus. With these lenses he saw 6/6 with either eye. I saw him again quite recently, and his myopia is unchanged.

In this case the boy remained at his public school, and beyond forbidding him to read in bed, and care as to the proper illumination of his reading matter, no special instructions were given. He has been working extra hard so as to pass the London Matriculation examination, thus his eyes have not been rested, but have, rather, been severely tested. His case is in marked contrast to the one preceding.

III.—The next case is perhaps even more striking. This boy I first saw in March, 1929, when he was 14 years of age. His vision was only 6/18 with either eye with the glasses he was then wearing, and his refraction was right and left eye -2·50 D. Sph. -1·0 D. Cyl. vert. In December, 1930, his myopia had increased to right and left eyes -3·75 D. Sph. -1·0 D. Cyl. vert. and with these lenses he saw 6/6 with either eye. I now started the administration of Calcium and Parathyroid. In August, 1931, he had grown in the previous six months 3 inches and his weight had increased 12 lbs. and he was now just 17 years old. In December, 1931, his vision with glasses was still 6/6 with either eye, and since the calcium had been started there had been no increase in his myopia. This boy had continued his studies at his school, and he had been working extremely hard, as he was entering for his London Matriculation.

When one surveys these three cases, which are typical of many I have observed at the Sussex Eye Hospital and in my private practice, I think that one is forced to admit that the administration of calcium influenced the course of the latter two considerably. In the first case no calcium was administered, and the myopia increased in spite of very careful precautions, and in the other two the myopia was arrested, although these precautions were omitted. I should like to note in passing that I have tried various preparations of calcium, but obtained no results unless they were administered with parathyroid extract.

In the second case calcium was given from the beginning, and except for the increase of half a dioptre in the middle of his treatment, the myopia did not increase. In the third case the myopia advanced at the start until calcium was given, and from that time there was no further increase.

So far we have only discussed the clinical aspect of the question. In the works of the various authorities, which I have consulted, I can find no mention of the presence of calcium in the scleral tissues, but its presence has been demonstrated for me by an analyst with the micro-spectroscope.

I think that I have made out a fairly strong case for supposing that progressive myopia is in reality a symptom of calcium deficiency. I have heard that the administration of Bemax has been of use in arresting progressive myopia. I have not had sufficient experience of its use as yet to speak of it as a substitute for calcium and parathyroid, but on observing its analysis table one sees that calcium is present in a fairly high proportion. Bemax contains vitamins, and they may assist in the introduction of the calcium into the tissues. Thus, if Bemax is really efficacious in arresting progressive myopia, its action may well be due to its calcium content.

I hope that this paper may induce other oculists to try the administration of calcium in cases of myopia under their care, so that they may see if they obtain results similar to mine.

In the *Brit. Jl. of Ophthal.*, Vol. XI, No. 5 (May, 1927) Mr. D. J. Wood of Cape Town in his paper states that for some years he "had been aware that some ocular conditions are associated with or caused by a deficiency in the amount of calcium in the blood." He then describes several cases in young children suffering from myopia. He points out that progression goes hand in hand with calcium deficiency. This observation of his has certainly been borne out by my own. He also points out the necessity of prescribing parathyroid extract with the calcium.

OXFORD OPHTHALMOLOGICAL CONGRESS
XXIInd ANNUAL MEETING, 1932

THE meeting of the Congress took place on July 7, 8 and 9 at Keble College, Oxford and the papers were read in the Department of Human Anatomy and in the University Museum.

The retiring Master, Mr. BERNARD CRIDLAND, extended a welcome to all those present and in particular to those who had travelled a long way to attend the Congress, among whom were Dr. Luther Peter of Philadelphia, Professor van der Hoeve (Leiden), and Professor Pascheff of Sofia. Mr. Cridland paid a special tribute to the Secretary, Mr. Russ Wood, whose work and efforts were invaluable to the success of the Congress.

He welcomed Mr. Cyril Walker as the New Master and performed the ceremony of installation.

ADDRESS BY DR. LUTHER PETER OF PHILADELPHIA:—"The Treatment of Non-paralytic Strabismus, excluding operative details."

Dr. LUTHER PETER gave an outline of the modern conception of concomitant squint and urged the necessity of treatment as soon as the diagnosis was made. He described the types of squint, convergent and divergent, unilateral and alternating, and stated that the prevailing type was the unilateral esotropia. Aetiological factors consisted of a defective fusion faculty; a refractive error, usually hypermetropia with a higher degree in one eye than the other: hereditary and other precipitating causes. The barriers to establishing an effective cure are total amblyopia and defects in the central field of vision. It is essential to treat concomitant squint before the sixth year of life. The refractive error should receive full correction at the earliest moment. Children of 12 or 16 months of age will use glasses. The refractive error should be "checked up" once a year. Whilst wearing glasses the squint may become alternating in type, and glasses may fail to give a satisfactory result because of excessive deviation and anatomical changes in the internal rectus. Amblyopia does not occur in true alternating squint and when present is often associated with a small relative scotoma. It rarely develops after the age of 7 years. If no attempt is made to correct it, it increases. Occlusion may in the course of six to eight weeks bring about a transference of the squint and also lowered visual acuity from one eye to the other. Atropine in the fixing eye has the disadvantage that the child is sometimes unable to tolerate the glare of light and so cannot have its full share of sunshine. A soft black mesh occlusion bandage is more effective. When amblyopia is present occlusion should be practised for longer periods than in other cases—three to six hours. Dr. Luther Peter spoke of the importance of affording the child useful and interesting occupation at the near point and of gaining the co-operation and enthusiasm of the parents.

Operative treatment is indicated in those cases of squint which are 25 degrees or more and because of this mechanical defect fail to respond to orthoptic training. Dr. Luther Peter prefers to operate about the 3rd or 4th year of life and does so under general anaesthesia. He employs advancement of the external rectus muscle, resection of part of this muscle and recession of the internal rectus according to the degree and nature of the squint. In many cases single binocular vision takes place within one month after operation. In cases where there are 35 degrees or more of squint two operations may be necessary. Orthoptic training is carried on after operation. Recession is recommended as a reserve or supplementary operation and the muscle should not be recessed more than five millimetres behind its original insertion. It is especially valuable when there is contractive of the internal rectus.

Dr. Luther Peter gave an outline of stereoscopic training; training by prisms base out and then base in; and the indications for the various types of surgical procedure.

This paper was keenly discussed. MR. BERNARD CHAVASSE (Liverpool) stated that treatment of squint was unsatisfatory in the bulk, the sequelae of correction producing a vicious circle. He believes that the problem of squint concerns (*i*) Phylogeny and the study of the way in which the visual axes change and the stages through which primitive conjugation passes. (*ii*) Neurology, the primitive labyrinthine control, the reflex of primatral convergence and the bifoveal reflex of ocular posture. (*iii*) Psychological factors, the operation of the steroscopic instinct, the frustration of which leads to a state of atavism and (*iv*) Aetological factors. He mentioned the peculiarities of squint associated with serious ocular lesions. Mr. Chavasse urged that preventive work might be done by examining the refraction of children where one or other parent has possessed a squint.

Mr. A. ORMOND (London) spoke of hereditary factors in the production of squint and gave the pedigrees of some families suffering from hypermetropia. He believes that squint is a manifestation of an interference with the normal development of the eye after birth.

Mr. E. ALABASTER (Birmingham) described the work done by the personel of his orthoptic clinic. He finds that occlusion improves the visual acuity and the tone of the extra-ocular muscles. Improvement in the acquirement of accurate projection followed a method of treatment known as "flashing" on to the macula. Mr. Alabaster showed a series of interesting charts comparing the results obtained in visual acuity, the angle of squint and the fusion faculty by occlusion, the synoptophore and cheiroscope and after operation.

Mr. WILLIAMSON-NOBLE (London) described familiar factors in the aetiology of squint and pointed out the prophylactic work that might be done in this connection. He recalled a case where a haemorrhage into the right optic nerve sheath at birth had produced a squint associated with a visual field defect. As an alternative to occlusion he uses atropine in the fixing eye and places before this a plane glass, the squinting eye having the full correction. He emphasized the importance of using a cylinder during retinoscopy and of the duochrome test in determining the spherical correction.

He emphasized the importance of using a cylinder during retinoscopy and of the duochrome test in determining the spherical correction.

DR. STEWART BARRIE (Glasgow) gave an analysis of 71 cases which had been under his care and expressed his deductions from the results of these.

Mr. MALCOLM HEPBURN stressed the importance of anatomical correction of the visual axes. He believes that tenotomy is a useful operation and that the results are only unsatisfactory where the surgeon has erred in his judgment. Advancement he reserves for bad cases and then uses it combined with tenotomy.

Mr. STENHOUSE STEWART (Hull) said that squint is concerned with the problem of innervation and that the fault lies chiefly with the binocular innervation of the internal recti. Peripheral irritation may give rise to over-action of both internal recti. Mr. Stewart advocates the use of a ruby glass before the fixing eye in place of occlusion.

Mr. MADDOX (Bournemouth) paid a tribute to Dr. Luther Peter's paper and emphasized the importance of giving the child interesting occupation during a period of occlusion. The two bugbears in treatment are cerebral and retinal amblyopia and false projection.

Professor VAN DER HOEVE (Leiden) said that much depended upon the individuality of the squinter and the oculist. The treatment of squint is a difficult field. He believes that it is not right to give glasses for such small degress of hypermetropia as 0·5 D. and 1·0 D.

Dr. ARTHUR HALL (Professor of Medicine in the University of Sheffield) gave an address on "The Oculogyric attacks of Chronic Epidemic Encephalitis," accompanied by cinematograph illustrations.

These attacks have certain features in common, they recur, the attacks are of varying duration, they are uninfluenced by treatment, and vision is normal between the attacks. Charts were shown to illustrate these points as regards the duration of the attack, the state of the lids, and deviation of the eyes when the gaze was fixed, when there was inability to open the eyes and during oculogyric attacks. When the attack sets in the eyes shoot in an upward direction. The onset is sudden but sometimes gradual and both sexes are affected about equally. Young persons are more commonly affected but the disease may occur at any age. In the early stages the eyes can be pulled down during an attack but go up again. An attack may be induced by watching a football match or the cinematograph and can in some instances be cut short by suggestion, the termination is in sleep and the attack is finished on waking up. All cases exhibit the Parkinsonian features. The aetiology remains uncertain. Dr. Hall gave an analysis and showed cinematograph pictures to compare the movements of the eyeball during sleep, in winking, and on attempting to close the eyelids in cases of Bell's palsy. He demonstrated diagrams of his conception of the nervous mechanism involved when the eyes are closed and opened.

In the discussion that followed Dr. Gibson (Oxford) commented on Dr. Hall's address as being an excellent exposition of clinical medicine at its best.

Professor Pascheff (Sofia) and Mr. Montague Harston also took part in the discussion.

Mr. LINDSAY REA (London) demonstrated a new cataract knife made with a longer and thinner blade (31 × 1·5 mm.) than other knives.

Mr. ZORAB (Southampton) read a paper on "Glaucoma Simplex Familialis" and illustrated this by pedigrees.

Mr. Neame took part in the discussion and described a case that had come under his care.

Mr. H. B. STALLARD demonstrated the microphotographs of "Two unusual cases of Sarcoma of the Choroid," one occurring in an eye affected with chronic uveitis and the other in a woman, aged 27 years, who was six months pregnant.

The Doyne Memorial Lecture.

Professor VAN DER HOEVE (Leiden) gave the Doyne Memorial Lecture and chose as his subject "The Ocular Signs in the Phakomatoses of Bourneville, von Hippel-Lindau and of Recklinghausen."

He spoke of the honour he felt in being invited to deliver this lecture and before he began he paid a tribute to the memory of the late Robert Walker Doyne, the founder of the Congress.

Professor van der Hoeve presented a chart comparing the pathological lesions met with in the organs of the human body in the phakomatoses as described by Bourneville, van Hippel and Lindau and Recklinghausen. He believes that this group of anomalies are one and the same disease, and that the name phakomatosis embraces them all. An hereditary factor is present. In the brain, spinal cord and canda equina there are glial and ganglionic cells, and these possess embryonic characters and are not differentiated. Cysts may be present particularly in the cerebellum and some parts of these tumours are angiomatoses. Glial proliferation may be primary or secondary. Similar pathological changes may occur in other nerves such as the ciliary nerves and nerves of the cornea. Photographs of sebaceous adenomata, multiple pro-adenomata, horse-shoe kidney, and phakomatoses of the optic nerve, the papilla and retina were shown. The lecture was admirably illustrated by fundus paintings, radiograms, histological sections and photographs of organs removed post-mortem. Professor van der Hoeve has made a most thorough and painstaking survey of this subject, which is of interest to the general physician, the surgeon, neurologist, dermatologist, ophthalmologist, gyneaecologist and radiologist.

The master presented the Doyne Memorial Medal and expressed thanks to Professor van der Hoeve.

Mr. BURDON COOPER (Bath) read a paper on "Some Observations in the Practice of Refraction." He advocates the use of crossed cylinders in determining the strength and axis in the final correction. Mr. Burdon Cooper emphasized the importance of first finding the proper spherical correction and after every change of the sphere re-testing the cylinder for its amount and axis. Necessary changes in the axis varied from 5 to 45 degrees, the average being 5 to 15 degrees. It is probable that the refraction becomes altered by lental changes produced during an effort at accommodation. Mr. Burdon Cooper uses the orthogon in determining the axis and amount of astigmatism. It is better to under-correct astigmatism with the rule and to over-correct astigmatism against the rule.

This paper was keenly discussed by Messrs. Harrison Butler, Young, Williamson-Noble, Preston, Dastoor, Alabaster, Stewart Barrie, Hanson, Lindsay Rea, Alston Hughes, Whittington and Dr. Luther Peter.

Dr. RONALD CANTI (London) gave an "Address and Cinematograph Demonstration of Living Tissue Cultivated in Vitro."

This work was carried out in the Strangeways Laboratory at Cambridge and also at St. Bartholomew's Hospital. The cells for living tissue culture were taken from the embryo chick, the rat, rabbit, and Yensen's rat sarcoma. The cinematograph was speeded up so that in three-quarters of an hour there was shown three weeks actual experimental work. The effects of cell reproduction, phagocytosis, growth and the results of irradiation of sarcoma by the beta rays of radium were amazing. Similar work with dark ground illumination was also shown.

PROFESSOR PASCHEFF (Sofia) read a paper "On the Laws of True Trachoma." He described the follicular reaction of the conjunctiva to many reagents. The follicles may be diffuse, small, confluent, and may burst and cicatrise. Trachoma follicles have a germinating centre and are confluent. The pathological changes at the limbus in trachoma show areas of thickening and germinating follicles divided by vessels which take origin from the upper fornix and phica semilunaris.

Colonel R. E. Wright (Madras) in discussing this paper spoke of the difficulties in making a diagnosis. Mr. Montague Harston and Mr. Harrison Butler also made contributions.

Mr. GEORGE BLACK described the "Treatment of Detached Retina by Multiple Trephining and the Application of Caustic to the Choroid." The retinal hole or tear is accurately located and the operation planned to promote a chemical choroiditis in its immediate vicinity, omnopon grs. 1/3 and scopolamine grs. 1/100 are given before operations. Cocaine 4 per cent. is used for local anaesthesia. A large incision in the conjunctiva and Tenon's

capsule is made and care taken to obtain complete haemostasis. Trephines 1·5 mm. in diameter are used. Pieces of sclera are removed piecemeal until the choroid is reached. The exposed choroid is touched with solid cocaine before applying the caustic. Absolute haemostasis is essential. The stick of caustic soda is mounted in wax and the end sharpened to form a point just before operation. The choroid is touched for one second in each trephine hole and then swabbed with dilute acetic acid one per cent. The choroid is then perforated by a blunt instrument, one third of the number of trephine holes being punctured. Mr. Black described the post-operative treatment and gave an analysis of 37 cases. The chief complications are vitreous haemorrhage, massive uveitis with increase of the detachment and thrombosis of a vena vorticosa.

Mr. H. D. DASTOOR (Bombay) followed with a paper on "Recent Advances in the Operative Treatment of Detachment of the Retina."

Other papers of interest were "Some Suggestions regarding the Treatment of Amblyopia ex anopsia" by Mr. KAY SHARP (Leeds) and "The Aetiology of Miner's Nystagmus by Mr. W. S. ROCHE (Newport). In this latter paper investigations were carried out on the quality of the coal being worked, the age of the pits in years, the limits of volatile matter in coals, the percentage of electric lamps in use, depth and thickness of seam, method of working, barometer readings, humidity at the face, velocity of air at the face in feet per minute, analyses of air, carbon dioxide, methane, oxygen, carbon monoxide, the percentage of light reflected from the coal, the temperature at the face and general conditions.

Demonstrations in the Scientific and Commercial Museums.

MISS MADDOX (London). A test series of synoptophore slides for the purpose of grading the intensities of binocular vision.

A stereoscope on a kinetic principle.

PROFESSOR PASCHEFF (Sofia). Histological slides demonstrating dystrophia hereditaria corneae and conjunctivitis pustulosa suppurativa.

Mr. ARTHUR GREENE (Norwich). A tiny toy projectileless pistol which caused a traumatic cataract in a child.

Mr. S. TUDOR THOMAS (Cardiff). Transplantation of scleral tissue on to the cornea of a rabbit.

COLONEL R. E. WRIGHT (Madras). A series of water colour pictures of external diseases of the eye taken in the Madras Ophthalmic Clinic, and a cinematograph demonstration of the ophthalmic clinic in Madras.

Mr. KAY SHARP (Leeds). Demonstration of the optophore.

Demonstrations of optical apparatus were given at the stalls of the following firms:—Messrs. Clement Clark, Clifford Brown,

Dixey, Hamblin, and Keeler. Messrs Down Bros. and Weiss exhibited surgical instruments and Messrs. Pulman's a stall for stationery, files and card index cabinets.

Social Events.

The Annual Dinner of the Congress was held in the Hall of Keble College on Thursday, July 7.

On the same day the members of the Congress were received by Professor and Mrs. Townsend at tea in New College.

The success of this Congress is characterized by the high scientific standard of many of the papers and the corporate life in Keble College which fosters a spirit of *bonhomie* and promotes informal and valuable discussions on medical and other matters.

H. B. STALLARD.

COUNCIL OF BRITISH OPHTHALMOLOGISTS

Report on the Subject of Compensation for Eye Injuries

THE Council of British Ophthalmologists having considered the subject of Compensation for Eye Injuries has arrived at the following conclusions:—

The attention of the Council was drawn to this matter by a paper read by Dr. J. Paterson of Edinburgh to the Ophthalmological Society of the United Kingdom in 1931, from which the following is a quotation:—

> "The greatest advance in ophthalmic compensation would be a definite scale of payment, on a percentage basis, for the actual blinding or loss of an eye. If such payment were made immediately, and without question, where the loss of an eye was proved, much of the tendency to remain off work would, in my opinion, be counteracted. The present methods are calculated to arouse a valetudinarian habit of mind in the workman, and the period of incapacity tends to be greatly prolonged."

It is admitted that in many, if not in most, occupations, the employee could learn to perform his work and earn the normal wages, with a single eye, and if we were dealing with an accommodating employer, a willing employee, and a guarantee of continued employment, the present form of compensation, *i.e.*,

payment of part wage during incapacity, would usually be adequate, but a number of factors disturb this ideal state:

1. There is usually no guarantee of permanency in the employment, and if reduction of staff takes place the less efficient workman is discharged, and if he is known to have a disability, or has a visible disfigurement, his chance of re-employment is reduced.

2. Except in the case of the relatively few key men or indispensables, the existence of friendly relations between employee and employer does not come into the picture. The question of compensation lies between the employed, or his agent, and the Insurance Company.

3. The loss of an eye entails several quite definite handicaps—contraction of field, loss of stereoscopic vision.

4. Even a perfectly willing workman cannot always adapt himself readily to work with a single eye, and in certain occupations this is particularly difficult. Age is a factor of some importance.

5. A man who has lost one eye is naturally apprehensive as to the safety of the second eye if he resumes the same occupation.

6. Where the injured eye has not been completely blinded, or removed, distortion of vision with it may interfere with working capacity.

For these and other reasons, many workmen, even of the most self-respecting type, refuse the settlement offered, and once the process of litigation sets in, the state of affairs arises with which we are all familiar: the accident, the disability, the prospects of his "case," prejudice against Insurance Companies, become the man's chief interests in life, and his discussions with his friends, relations, and legal agent, react on him to produce (apart altogether from wilful malingering) a deterioration of eyesight, general morale, and general physique. Much money may be expended on law agents and medical witnesses with very little definite gain to the man.

What has been stated above regarding loss of an eye applies naturally to cases of partial loss of an eye, disfiguring injury, and so on.

If workmen's compensation could be made to include not only payment of part wages during disability, but also payment of a lump sum on a definite scale in respect of loss of an eye, or of a proportion of central vision, or of a part of the field of vision, there would be less delay in the settlement of claims, less of the subsequent general demoralization with deterioration of eyesight and health, and less litigation.

The Council having carefully considered this question, is of the opinion that the Workmen's Compensation Acts should be

amended in such a way as to secure to the injured workman, in addition to the benefits at present allowed in respect of loss of earning power, a lump sum payment to compensate for permanent loss of function and/or disfigurement.

This principle is already embodied in certain schemes operated by private firms in this country. The Council is able to add to this Report some details of such a scheme.

It should further be pointed out that the principle of lump sum payments for partial or total loss of vision and other ocular disabilities, was recognized in the regulations for the granting of War Pensions.

We have not attempted to deal with the construction of a scale of payments in detail, but it will be observed that in the Scheme, appended to this Report, the workmen are divided into classes according to their earnings, and that the lump sum payment received in respect of the loss of an eye is approximately equal to one year's earnings. A scale of percentage payments would naturally take into account different degrees of loss of central and peripheral vision, disturbance of binocular vision and judgment of distance, loss of the eyeball necessitating the use of an artificial eye, deformity of the socket interfering with the use of an artificial eye, disfigurement of the eye and eyelids, and other similar factors.

We would suggest further that it is very desirable that means should be devised to reduce the frequency of resort to the County Courts in Workmen's Compensation Cases and that assessment of damage done and loss of efficiency sustained in eye cases should be made, in the first instance, by two Ophthalmic Surgeons acting in consultation.

Appendix

The following is an extract from a letter received by the Council from a member of a large industrial firm, who reports that the Scheme to which it refers has been working satisfactorily for a number of years:—

"Our Scheme is administered, not by the firm, but by a Committee of our own men, and the result has been that we are satisfied that not only are legal actions in the public courts avoided, but also a more intelligent and sympathetic handling of individual cases is possible than when an insurance company is dealing with the case and naturally fighting for its own hand."

"Our Scheme, of course, gives all the benefits incorporated in the Workmen's Compensation Act in force at any time, but also gives additional benefits in the form of "Solatium," paid from a fund to which both the firm and the employees jointly contribute. It is under the "Solatium" part of our Scheme that

an employee is re-imbursed for damage to eyesight, which is a benefit additional to the aliment which he receives while he is off work consequent on the injury to the eye, either under the Workmen's Compensation Act or under our interpretation of it."

"We divide our workmen into various classes, dependent on their earnings, and the "Solatium" for the loss of an eye varies in accordance with the class of the man. I need not give you all the details, as a single example would perhaps serve your purpose."

"A man in Class I—*i.e.*, in receipt of an average weekly pay of 60/- or over—would receive for the loss of an eye in "Solatium" a sum of £180, less a small deduction. The deduction is the aliment which he has received during convalescence, and if he were off (say) eight weeks it would be £12. His nett "Solatium" would then be £168. Workmen in lower classes receive correspondingly less, but in no case is the total sum inferior to 75 per cent. of that quoted above. An injury to an eye involving partial loss of eyesight would be "solaced" pro rata to the extent of the injury as certified by the Optical Arbiter. Thus, if the Class I man noted above lost 'half an eye' and were convalescent for eight weeks, he would receive a "Solatium" of £78. . . ."

ABSTRACTS

I.—ANATOMY

Koby (Bâle).—Concerning the thickness of the living cornea (A propos de l'épaisseur de la cornée vivante). *Rev. gén. d'Ophtal.*, June-July, 1930.

In the 1929 volume of this Journal, on page 137, will be found an abstract of an article by Koby and Juillerat which deals with the calculation of the thickness of the living cornea as examined by the slit-lamp. In this article **Koby** pronounced the thickness of the centre of the cornea to be around the figure 0·58 millimetre.

The present article deals with the same subject as studied by a different method, namely the employment by Fincham of his biomicroscope. Fincham's figures for the centre of the cornea are as follows:—

The most frequent value is 0·55 millimetre.

The arithmetical mean is 0·53 millimetre.

Koby's figures were respectively 0·58 and 0·59 millimetre.

Koby considers that these figures correspond fairly well considering that the methods are different; and considers also that they are nearer the mark than the anatomists, figures of 1 millimetre.

At the end of his abstract above referred to the reviewer remarked: "The practical result seems to be that when dealing surgically with the cornea, at any rate with its centre, we have only something more than half the thickness to work with that we have hitherto assumed to exist, for is it not usual to say that the cornea is 'about' a millimetre thick?"

ERNEST THOMSON.

II.—CONJUNCTIVA

Nichelati (Salò, Brescia).—Two cases of infection of the conjunctiva by larvae of Oestrus Ovis. (Due Altri Casi di Miasi Congiuntivale da Larve di Oestrus Ovis). *Ann. di Ottal.*, November, 1930.

The outstanding feature of these cases is the rapidity with which intense irritation of the conjunctiva comes on after a blow from an insect on the eye. Burning, with a copious lacrimation follows immediately. Careful examination of the conjunctiva will show the cause to be one or more small rapidly moving larvae which hold tenaciously to the conjunctiva.

In the cases here reported, the larvae agreed closely with those of Oestrus Ovis in appearance. They have a number of chitinous hooks at the anterior extremity with which they hold to the eye and cause the irritation.

Oestrus Ovis is often viviparous, and the brief interval between the attack of the fly and the onset of symptoms, seems to prove that in these cases the living larva was deposited.

Nichelati suggests that this fly is probably the real cause in many instances in which other diptera have been accused. The similarity of the larvae makes accurate distinction difficult.

HAROLD GRIMSDALE.

III.—OPERATIONS

(1) **Verderame, F. (Turin).—Corneal tattooing by the chloride of platinum method. (Tatouage de la cornée au chlorure de platine).** *Rev. gén. d'Ophtal.*, June-July, 1930.

(1) **Verderame** recounts the various methods of tattooing the cornea since the era of Galen, admitting that there is a gap in the literature between the time of Galen and the year 1861. Galen's

method was to touch the leucoma with the point of a hot stylet and then to apply a mixture of gall-nut and pomegranate bark. In the year 1861 Riva tried Galen's method in one case, with results which discouraged him from trying it again. Then came the period which commenced with de Wecker who introduced the use of Chinese ink. This was followed by the employment of various kinds of soot, and even of choroidal pigment. All these methods were based upon the introduction mechanically of ready prepared colouring matters into the corneal layers. In the year 1925 Knapp, of Bâle, introduced the method of chemical tattooing, the colouration being obtained in the tissue itself by means of a chemical reaction between chloride of gold and a reducing agent such as tannin. The method was open to the objection that the result was a brown or a greyish black tint rather than the required black of the pupil. In 1928 Krautbauer succeeded in obtaining a perfect black by the reaction between platinum chloride and hydrate of hydrazine. Other operators employed the method, Verderame among them. Verderame treated four cases, all with a successful result. Full details are given of these four cases and a note is included of the operative technique. These details must here be abbreviated:—

(1) Cocaine and adrenaline. (2) Lavage with ***sterile distilled water.*** (3) Delimitation of the operative zone with a trephine. (4) Epithelial curettage of the zone. ***No lavage.*** (5) Light application by means of a small cotton swab on a glass rod of 2 or 3 per cent. solution of platinum chloride for 1½ or 2 minutes. (6) Immediately after this the drop by drop instillation of a 2 per cent. solution of hydrate of hydrazine for 20 to 25 seconds (8 to 10 drops in all). (7) As soon as the tattooed zone is perfectly black, immediate irrigation with sterile distilled water to remove the surplus reducing agent. (8) Lavage of the cul-de-sac with normal saline. (9) Boric vaseline into the cul-de-sac. (10) Binocular dressing for 48 hours, followed by uni-ocular until the corneal epithelium is re-formed.

Verderame is greatly pleased with the technical results of Krautbauer's operation and with the simplicity of the technique. The following precautions are necessary*:—(1) The platinum salt should be prescribed "***platinum chloratum siccum Orig. Merck.***" One must avoid "***platinum chloratum—chlorure Merck***" which is not soluble in water. (2) The hydrate of hydrazine should not be employed more than four weeks after its preparation.

* No. 1. It would be very advisable for British surgeons to ascertain the exact chemical formulae corresponding to the words in inverted commas.

ERNEST THOMSON.

(2) **Graf, K. (Lwów).—Iridectomy and injury to the lens. (Iridektomie und Linsenverletzung).** *Zeitschr. f. Augenheilk.*, Vol. LXXIV, p. 376, 1931.

(2) **Graf** draws attention to the frequency with which the lens capsule is injured in doing iridectomy for glaucoma. On microscopic examination there was found capsule together with the excised iris in four out of 22 cases. In one of these four a complete cataract developed. In 32 control cases of iridectomy for cataract, capsule was present in three cases, in all of which the anterior chamber was shallow. It is by such accidents that the occasional maturation from preliminary iridectomy can be explained. The author implicates the toothed iris forceps in the damage to the capsule.

ARNOLD SORSBY.

(3) **Bunnell, Sterling (San Francisco). — Vertical skin-grafts for reconstruction of eyebrows.** *Surgery, Gynecology and Obstetrics*, August, 1931.

(3) If Wolfe grafts of the hair-bearing area of the scalp be used for reconstruction of eyebrows, the result is unsatisfactory, because the graft has to be of such thickness that necrosis sets in before healing is complete. **Bunnell** has therefore devised a method of implanting strips of hair-bearing skin sufficiently thin to become vascularized before necrosis sets in. The operation is done in the following manner:—Three Bard-Parker scalpel blades, with two strips of sheet metal, each 1·5 mm. thick between them, are clamped together by two Mayo haemostats. An area of scalp in the mid occipital region is shaved and painted with iodine. One vertical stroke of the tri-bladed scalpel down the mid line of the scalp results in the production of two slices of hair-bearing skin each 1·5 mm. wide. These are implanted into a deep incision made along the line of each eyebrow and secured with sutures. The upper end of each graft is placed medially so that the hairs point laterally. The operation can be repeated within a month, and after three or four such procedures, eyebrows of sufficient thickness can be produced.

F. A. W.-N.

(4) **Walker, Clifford B. (Los Angeles).—Trephine operation.** *Arch. of Ophthal.*, April, 1931.

(4) **Walker** is of opinion that there are two main causes for the variations in the results of trephining: (1) pressure and unnecessary injury to the iris, zonule and ciliary region; (2) implantation of foreign substances (grit, grinding powder, etc.) from the inside of the trephine. He therefore suggests two modifications in the

operation. The first is the use of a trephine with two windows cut in it 1·5 mm. from the cutting edge. The second is the insertion of a stitch into the button of sclero-cornea, the ends of the stitch being drawn out through one of the windows in the trephine. The advantages claimed for these procedures are as follows: The windows allow the instrument maker to give a clean bright surface to the inside of the trephine, and the surgeon to verify its cleanliness by inspection—the slit-lamp is recommended for this purpose. They also allow the surgeon at the time of operation to see exactly what is happening. If, for example, the iris is seen to bulge up into the front portion of the wound, injury to this membrane can at once be avoided by tilting the trephine backwards so allowing a clean disc to be cut out. The stitch allows the button of corneo-sclera to be drawn up against the cutting edge of the trephine thus avoiding undue pressure on the ocular contents, it also prevents loss of the disc into the anterior chamber, and allows of very delicate manipulation when one or other edge requires to be more deeply cut. The practical outcome is that since adopting these precautions, the author has had no cases of post-operative iritis.

F. A. W-N.

IV.—MISCELLANEOUS

(1) **Gourfein, D. (Geneva). About local immunity of the organ of vision. (De l'immunité locale de l'organe visuel). *Rev. gén. d'Ophtal.*, January, 1930.**

(1) **Gourfein** reminds us that the eye is in a singular position with regard to immunity. Antibodies in the blood serum do not always confer immunity upon the eye even when the whole organism is immunised. Axenfeld, for example, immunised rabbits against the pneumococcus. In these rabbits an intravenous injection of pneumococci, many times the fatal dose, had no result; yet a small dose injected into the vitreous brought about panophthalmitis. Gourfein carried out a series of experiments in the same direction but this time with the object of obtaining local immunisation by local instillation or injection. He gives a full account of eight of these experiments, all on rabbits, directed against the bacillus of Koch, the staphylococcus aureus and the streptococcus. These experiments were carried out in 1925 and the results were negative. "Le vraie methode pour obtenir l'immunisation locale de l'oeil est encore à trouver."

ERNEST THOMSON.

(2) **Lebensohn, James E.** (Chicago).—**Car sickness.** *Arch. of Ophthal., September, 1930.*

(2) **Lebensohn** considers that labyrinthine stimulation is an important factor in this disease although it may be predisposed to by uncorrected errors of refraction or of muscle balance. Some interesting experimental work was done by swallowing a stomach balloon and connecting it with a water manometer which recorded on to a revolving drum. Induction of ocular nystagmus by following moving objects caused an increase in gastric tone and motility but no nausea. Irrigation of the auditory meatus with cold water caused an immediate rise of gastric tone, similar to that obtained by irrigating the skin of the auricle, and therefore not labyrinthine in origin. Later, however, the labyrinth comes into play and there is a loss of gastric tone, depending on the degree of nausea. The author has shown in a previous paper that asthenopia is a gastric depressant. It follows, therefore, that asthenopic individuals will have a lowered threshold for the production of nausea.

F. A. W.-N.

(3) **Hirschman** (Detroit). — **Focal infection of anal origin.** *Jl. Amer. Med. Assoc., November 28, 1931.*

(3) Most ophthalmic surgeons are now familiar with morbid conditions of the eye caused by focal sepsis in the oral cavity, the tonsils, the alimentary canal and the prostate. An added terror has been found by **Hirschman** in an inflammatory condition of the crypts of Morgagni, which are situated at the junction of the anal canal and the rectum. He instances the case of the head of a large manufacturing firm who had been troubled with pain over the right eye for two years. This had been treated unsuccessfully by physicians, osteopaths and anybody who would offer him relief. He had had sinus treatment and both tonsils had been removed. On account of some rectal irritation he was referred to Hirschman for examination. Marked cryptitis with accompanying enlargement of the papillae was discovered. The removal of the crypts and papillae under local anaesthesia was accompanied by the first relief from the neuralgic pains that the patient had received for two years. During a period of two years after the operation he has had no return of his former disability.

A. F. MACCALLAN.

(4) **van Duyse, M.** (Gand).— **Heredity in ocular maladies.** (**L'Hérédité dans les Maladies Oculaires**). *Arch. d'Ophtal., October, 1931.*

(4) **van Duyse** was invited by the Société française d'Ophtalmologie to prepare the annual *Rapport* for 1931, upon "Heredity in Ophthalmology." He presented a report noticeable alike for its

comprehensiveness and clarity: the discussion which ensued evidenced the interest of ophthalmologists in this subject. In the article under review van Duyse returns to the consideration of some of the problems with which this subject is liberally supplied. "For the basis of my researches, I took the laws of heredity scientifically established. The science of heredity is dominated by two conceptions:—that of ***heredity*** in the biological sense, which concerns the transmission of characters from parent to child, ... like father, like son; and that of ***variability***, in which lies the explanation of the differences between parents and their immediate offspring." "What are the foundations of these accepted views?"

This question van Duyse now deals with at considerable length, employing calculations with illustrative diagrams from the vegetable kingdom, in which the results in succeeding generations are more definite and can be more certainly foretold than in the animal kingdom, and especially in the human species. This portion of his paper cannot be satisfactorily condensed.

In the vegetable kingdom where a pathological character is dominant, it is possible to foretell with approximate accuracy the percentage of individuals inheriting this character, providing the number of new members of the family is unlimited.

This is not so in the human species, in which other methods of calculation, such as those devised by Bateson, are applicable. When an inherited disorder is dominant, it is met with in all generations, but never in the offspring of unaffected individuals. When recessive it may skip several generations, and be found in the children of parents who are themselves free.

The author groups hereditary disorders of the eye as follows:—

(1) Disorders with continuous inheritance (Mendelian dominant type).

In this group he places essential night-blindness as typical, and includes certain forms of cataract, glaucoma, adult and juvenile, blue sclerotics, etc.

(2) Disorders with discontinuous inheritance (Mendelian recessive type). Here he places true albinism, pigmentary degeneration of the retina, familial idiotic amaurosis, infantile and juvenile hydrophthalmos, etc.

(3) Sex-limited diseases. As examples of this type he selects Daltonism, Leber's hereditary optic atrophy, etc.

Mendelian laws do not explain this mode of transmission of disease. For its elucidation van Duyse invokes the chromosomic hypothesis advanced by Morgan and his followers, whose experience was obtained from experiments with a fruit-fly *(drosophila melanogaster)* very prevalent in America.

J. B. LAWFORD.

(5) **Teulières, M. and Beauvieux, J. (Bordeaux).—The irido-corneal angle: its rôle in ocular hydrostatics. (L'angle irido-cornéen; son rôle dans l'hydrostatique oculaire).** *Arch. d'Ophtal.*, August, 1930.

(5) This paper is the record of an extensive investigation. **Teulières** and **Beauvieux** desire that it should be considered "in some sort as a rehabilitation of the irido-corneal angle" which, conceived by Leber as an area of first-rate physiological importance, has been "cast from its pedestal in recent years, and relegated to the rank of an anatomical zone, indifferent to the functions and vitality of the eye." That this is no imaginary opinion is obvious from statements such as that expressed by Hamburger, in the *Klin. Monatsbl. f. Augenheilk.*, "Schlemm's canal is assuredly not devoid of function, but its significance and its necessity are not greater than those of the fifth finger or fifth toe." The views of Leber and the Heidelberg school have been energetically defended and justified by Seidel, Leber's successor. In the 36 pages of this communication will be found an analytical study of the work and theories of various writers, the anatomical and clinical evidence and the results of experimental investigation obtained by Teulières and Beauvieux, and their judgments. It is abundantly illustrated by full-page plates, coloured and uncoloured, and by micro-photographs. A valuable bibliography containing 53 references is appended.

Owing to the length and fullness of detail, an adequate review within ordinary limits is not feasible. Those who consult the original will be repaid by an interesting and clearly expressed account of the subject under discussion.

J. B. LAWFORD.

BOOK NOTICE

The Calcutta Medical Journal. Vol. XXVI, No. 8, February, 1932.

In an original article on Congenital Hereditary Nystagmus, B. Bhaduri surveys briefly the literature of this disease, and describes a patient who came under his care suffering from this complaint. A pedigree of this patient showed that the grandfather on the maternal side suffered from nystagmus, and that the disease was transmitted through one of his daughters, who, although unaffected herself, had five sons, four of whom had nystagmus from birth.

The clinical notes in this journal contain accounts of a case of

partially developed Graves' disease; and four types of blackwater fever seen in the Nofussil of Bengal, followed by an editorial note about blackwater fever and its differential diagnosis.

There is a small section devoted to abstracts of current medical literature, and a part of the journal is allotted to ophthalmological abstracts.

Medical news consists of notices about the VIIIth All-India Medical Conference; the Calcutta Gazette with details of hospital appointments; and the proposed examination regulations for the Membership and Licentiateship of the State Medical Faculty.

Proceedings of the All-India Ophthalmological Society. Vol. II, 1931.

This volume contains a list of the officers and committee of the All-India Ophthalmological Society and its ninety members; also the rules and regulations of the Society. There are accounts of the Presidential address, the "welcome speech" and the "opening speech." Twenty-three papers were read before the Society, many of which were illustrated.

Five papers were devoted to cataract, its operative treatment, complications and results. In one paper, Sir William Bowman was quoted as having written that he never laid down a method of extraction for universal application, but always operated as seemed best for the individual case at the time. In the same paper the author advocated that a surgeon who was not equally skilful with either hand, should adopt that method of operating which was of the best advantage to the patient. The intra- and extra-capsular operations were fully discussed, and the results compared. Some surgeons were in favour of the intra-capsular method for specially selected cases, but the majority preferred some form of the extra-capsular operation. The problems of operating on immature cataracts, uni-ocular cataract, extracting both lenses at the same time, and preliminary iridectomy were dealt with, and opinions on these matters expressed. One surgeon stated that couching for cataract is a justifiable operation where the patient is insane or suffers from a severe cough and insomnia. Pre-operative preparation, methods, and technical modification in operating and post-operative treatment and after-care were discussed.

In a paper on "Some Observations on the Treatment of Glaucoma," Banaji compares the operations of iridectomy, cyclo-dialysis, iridencleisis and trephining. He believes that cyclo-dialysis should be given a trial, and if this fails, then iridencleisis or a trephine operation.

There is a paper devoted to a description of the eye lesions due to syphilis, and an interesting description of a case of Mickulicz's syndrome. At the end of this volume there is an account of

ophthalmology in ancient India, the development of ophthalmology in Europe and India, and India's contributions to the knowledge of eye diseases and their treatment.

This volume consists of 163 pages, including the index and 23 plates, one of which is coloured.

CORRESPONDENCE

To the Editors of THE BRITISH JOURNAL OF OPHTHALMOLOGY.

SIRS,—The interesting reference made to the vision and refraction of the eyes of fishes in the Journal for April, 1932, raises anew many important considerations. Mr. Mayou found by retinoscopy that the eyes of fresh water fish examined were emmetropic or hypermetropic.

In the original paper published in the *Wien. klinisch. Wochenschr.* (Jahrgang, 1898) under the heading of an article entitled "Die Accommodation des Auges in der Thierreihe" Beer draws attention to the fact that the percipient layers of the retina in cephalopods and in fishes give discrepant results when the refraction is estimated by retinoscopy. The cephalopod has a retina with the percipient layer on the inner side of the eye adjoining the vitreous, whilst the fish on the other hand, following the usual arrangement met with in the higher animal kingdom, has the percipient layers on the outside of the retina and in the case of the fish the retina is unusually thick.

He pointed out that the retinoscopy indicated refraction at the surface and that consequently a substantial allowance in the case of the fish should be made in estimating the refraction of the percipient layers.

Furthermore his work was done on fishes under the influence of curare. If this precaution had not been observed the fish may well have been accommodating, as they do from the near to the far, by pulling the lens backwards.

Beer examined fishes eyes in water when the animals were under curare and were kept alive by artificial respiration. He examined them both for retinoscopy and by the direct method. He concluded that eyes which appeared to be somewhat hypermetropic were myopic and those which showed low grades of myopia were highly myopic. He further found that the range of accommodation varied as the degree of myopia and ranged from 2·0 D. to 10·0 D. and that in most fishes the eye could be rendered emmetropic by accommodation.

This may have taken place in the eyes examined by Mr. Mayou.

The subject of the method of accommodation in animals has become extraordinarily interesting because of the destructive criticism of theories of evolution which arise from a knowledge of the ascertained facts.

I am, etc.,

JAMES W. BARRETT.

MELBOURNE,
May 21, 1932.

A LATE SIXTEENTH CENTURY OPHTHALMIC BOOK IN ENGLISH

To the Editors of THE BRITISH JOURNAL OF OPHTHALMOLOGY.

SIRS,—In the article on *A Late Sixteenth Century Ophthalmic Book in English* which appeared in the June issue of the *Journal*, it was suggested that the translator of Jacques Guillemeau's *Maladies de l'Oeil*, whose initials are given as A. H. was one A. Hunton—a suggestion based on the imperfectly legible name given on the title page of a copy of the first issue of the translation. Pending the finding of another copy, this reading must remain conjectural. It was also rashly stated that "no information on A. Hunton could be traced."

Mr. R. R. James has kindly drawn my attention to some of the untraceable information. Thus Venn's *Alumni Cantabrigienses*, Vol. III gives "Hunton or Humpton, Anthony, sizar from Christs, June, 1575., B.A., 1578-9, M.A., 1582. Licensed to practice medicine 1589. Author, Verses (Cooper II, 241)."
The verses referred to are shown in C. H. Cooper and Thompson's *Athenae Cantab.* as commendatory lines to Gerard's *Herbal* (1597). They are in Latin, with interspersed Greek quotations. Further search has discovered an excellent account of *Anthony Hunton, M.D., an Elizabethan Physician, and his connexion with Harrogate* by W. J. Kaye in the *Thoresby Society Miscellanea*, Vol. XXVIII, p. 212. 1925. It appears that Hunton was born "about the year 1560, probably in Lincolnshire" and began to practise medicine at Newark-upon-Trent "at least as early as 1593." In 1606, James I nominated him as Lecturer in Medicine at Gresham College, but it was Dr. Mounsell, another Royal nominee, who was chosen "Phisick Lecturer." He was keenly interested in the development of Harrogate as a Spa and a contemporary speaks of him as a "famous Physitian." Judging by a record of fines and by his will, he seems to have had extensive monetary dealings.

The *Subsidy Roll* (Newark documents) contains the record of his burial. "Mr. Anthony Hunton, Doctor, 24 Dec., 1624." Kaye holds that it was probably "the wise counsel of the experienced Puritan scholar physician of Newark" that caused Harrogate to rise rapidly in contemporary esteem.

Mr. James also points out that in his brother's book (W. A. James, Southwell Grammar and Song Schools; Lincoln, Ruddock, 1927) there is an entry concerning one Anthony Hunton as chorister of Southwell Minster in 1574; but Mr. W. A. James does not think that this entry refers to the subject of his note.

If the Anthony Hunton of Kaye's paper is indeed the translator of Guillemeau, Kaye under-estimates Hunton's literary activities when he says that the prefatory verses to Gerard's *Herbal* are his sole literary achievement, for in addition to the translation, there are also extant the prefatory letter and verses to John Banister's *Compendius Chirurgerie* (1585).

Yours, etc.

ARNOLD SORSBY.

NOTES

Death

As we go to press, we learn with much regret of the death of Mr. J. F. Cunningham, O.B.E. A fuller notice will appear in our next issue.

* * * *

Honour

MR. PRIESTLEY SMITH has been elected an honorary fellow of the Royal Society of Medicine.

DR. D. D. PATON, Ophthalmic Surgeon of Perth, Australia, has been appointed President-Elect of the Fourth Australian Medical Congress which is to be held in Perth, Western Australia, in the near future.

* * * *

The Janus Stolp Prize

THE governors of the "Janus Stolp" foundation (*Legatum Stolpianum*) in the University of Leiden, at their meeting on the 25th May, 1932, decided on the following subject for their biennial scientific competition:—

"An original contribution on the Psychology of the Knowledge of Space in the Blind."

Suggestions.—Experiments made in the course of observations among the blind have been of some importance in the solution of the problem of their knowledge of space, thanks, especially, to the analyses of observations made on persons born blind (*e.g.*, refer to the work of M. von Senden, "Baum und Gestaltauffassung bei operierten Blindgeborenen vor und nach der Operation." Leipzig, 1932). Analogous observations should be capable of being subjected to scientific criticism. The education of blind persons directed to increasing their power of orienting themselves in space, to enable them to construct objects or to do manual work, to orient themselves in the street or in the house, and, more especially, to give them an idea of Geometry (*sensu strictiori*). (Refer to a paper by Th. Heller, "Studien zur Blindenpsychologie," Leipzig, 1904.)

Interesting conclusions might be drawn from an analysis of the practical work of blind surveyors, perhaps, also, by observation of blind workmen.

A study of the dreams of people born blind might even throw some light on the subject of the competition.

It is desired that competitors should choose only a part of the subject, but of sufficient extent to enable them to make a general résumé and a critical review. Entirely theoretical disquisitions, as well as observations embracing too many diverse points, are not desirable.

The manuscript must not exceed 40,000 words, and should be sent to the President of the Board, M. le professeur Dr. W. S. Kristensen, 31, Witte Singel, Leiden, before January 1, 1934. It must be typewritten in Dutch, German, English, French or Latin, and signed with a Motto and accompanied by a sealed letter with the same motto enclosing the name and address of the author.

The winning competitor will receive a gold medal of the value of 250 florins and 250 florins in money, or, if he should prefer it, the whole sum in money.

* * * *

The Gifford-Edmunds Prize

THE Gifford-Edmunds Prize for 1931 has been awarded to Mr. W. A. Gray, F.R.C.S., for his essay on the "The Ocular Complications of Diabetes."

FUTURE ARRANGEMENTS

1932

October 4.—Midland Ophthalmological Society, at Birmingham Eye Hospital.

CONTEMPORARY OPHTHALMIC LITERATURE

American Journal of Ophthalmology. *May, 1932.*

WILSON. Ophthalmia Egyptiaca.
CASTROVIEJO. Theoretical and practical study of the intracapsular cataract extraction.
FREYBERG. Adenocarcinoma of the lacrimal gland.
KRAUSE. The chemical constitution of the cornea.
CUTINO and LLOYD. Glioma exophytum.
COWAN and FRY. The hyaloid membrane of the vitreous.

June, 1932.

PETER. Amblyopia ex-anopsia in adult life.
BLAIR, BROWN and HAMM. Surgery of the inner canthus and related structures.
WELLS. Controlled reading.
OLAH. Rational employment of eye-drops and eye-ointments.
FERREE, RAND and HARDY. Refractive asymmetry in the temporal and nasal halves of the visual field.
LOMBARDO. A single sclero-muscular suture in Jameson's recession for squint.
CHAN. A corneo-scleral dermoid in a guinea pig.
BERENS and STARK. Studies in ocular fatigue.

Annales d'Oculistique. *May, 1932.*

DUPUY-DUTEMPS. Variation of the angle of convergence as a function of the obliquity of vision.
KOSTOULAS. Facial naevus with infantile glaucoma.
DUFOUR. The field of the ophthalmoscope.
TERSON. Oily 1 per cent percaine collyrium.
DELORD. Cure of infectious hypopyon keratitis by central fistula of the cornea.
DASCOLOPOULOS. On two cases of relapsing uveitis.

Archives d'Ophtalmologie. *June, 1932.*

TERRIEN, VEIL and DOLLFUS. Seven cases of detached retina treated by Guist's operation.
VILLARD. Spontaneous cure of detached retina.
BISTIS. On the action of insulin on the ocular tension.
BEYNE. The use of the diploscope for the measurement of certain heterophorias.
MICHAIL. On cystic lacrimal diverticulitis.

Klinische Monatsblätter für Augenheilkunde. *May, 1932.*

STREIFF. The influence or otherwise of the skin, hair or eye colour and the hereditary factors of the uvea and the rôle of the sympathetic on the final configuration and colouration of the iris.
HANDMANN. Further observations on rosette cataract.
JAENSCH. Difficulties and mistakes in the diagnosis of the choroidal sarcoma.
DVORAK. Three cases of anomaly of the fundus.
WAGNER. On the usefulness of the Dazet preparations in ophthalmic practice.
APIN. Observations on orbital anaesthesia.
FEIGENBAUM. A further case of supernumerary caruncle.
SAMOJLOFF. Some observation on the work of Dr W. von Roscin, "On the question of the occurence of blister-like swellings of the ciliary epithelium."

June, 1932.

V. PFLUCK. The teaching concerning accommodation in the light of modern research.
THIES. The female cycle and the eye.
BIERINGER. Lens extraction in aniridia.
POLLAK. On isolated tuberculosis of the sclera resembling a tumour.

STREIFF A revision of old and new findings in true early heterochromia.
V. SARBO. On the etiology of retrobulbar neuritis from the neurological standpoint.
HESSBERG. Unilateral practical blindness and the resultant diminution of capacity.
GASTREICH. Phleboliths in orbital varices with intermittent exophthalmos.
LACARRÈRE. "The Electrodiaphake."
V. CSAPODY. The rôle of the lens in the occurrence of retinal tears.
VORMANN. On the question of Gunn's phenomenon.
ISAKOWITZ. Remarks on the article by Wilhelm Feilchenfeld. "On voluntary control of the eye movements, especially rolling of the eyes."
FEILCHENFELD. Further notes on the observations of Isakowitz.
PAVIA. Reply to the observations of Hartinger on my article "A new arrangement for the investigation of the fundus in red-free light."

Annali di Ottalmologia e Clinica Oculistica.

January, 1932.

FAVALORE. On the attenuated and inconspicuous form of cicatricial trachoma.
LARICCHIA. Ocular changes in deaf-mutism.
SANTONASTASO. Ocular changes in leprosy.

Bollettino d'Oculistica. *April, 1932.*

CATTANEO. Filtrability and ultra-filtrability of the trachoma virus.
QUAGLIO. Researches on the refraction through the posterior surface of the human lens.
PANICO. The reaction of the rate of sedimentation of erythryocytes in ophthalmia.
ACCARDI. A case of progressive degeneration of the macula, and its surroundings.
BELLAVIA. Marcus Gunn's phenomenon.
CORDERO. Varicosity of the optic disc.
REGANATI. Buphthalmos in rabbits.

Lettura Oftalmologica. *April, 1932.*

BAQUIS. Final contribution of the study of tumours of the reticulo-endothelial system.
PERGOLA. On the treatment of trachoma and its corneal complications.

Revista de Oto-Neuro-Oftalmologica. *January and February, 1932.*

ROSSI. Concerning a case of tumour of the vermis.
PAGLIARI. A case of instantaneous bi-lateral blindness in serous meningitis.

Archivos de Oftalmología Hispano-Americanos. *June, 1932.*

LACARRÈRE. Our new method of complete extraction of senile cataract: The Electrodiaphake.
CABALLERO. Considerations on the pathogenesis of glaucoma.
DOMINGUEZ. On the immediate results of iridencleisis in glaucoma.
MENDOZA. Gonioscopy in the Clinic.

Revista Cubana de Oto-Neuro-Oftalmologica.

March and April, 1932.

COPPEZ. On the pseudo-sign of Graefe.
NICOLICH. Causes and prevention of blindness.
LACARRÈRE. Fimio-ocular diagnosis in bio-microscopy.

Revista Oto-Neuro-Oftalmologica. *June, 1932.*

FUCHS. Concerning the relation between arterio-sclerosis and the visual apparatus.
PAVIA. The fundus of the human eye. Its true recording. Its photography in colours.